



# Mac OS X Server

QuickTime Streaming and  
Broadcasting Administration  
For Version 10.5 Leopard

🍏 Apple Inc.

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019-0930/2007-09-01

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# About This Guide

## Learn about the QuickTime suite of products and what's new in this version of QuickTime Streaming Server.

Mac OS X Server version 10.5 includes QuickTime Streaming Server (QTSS) in its suite of services. QTSS comes preinstalled on Apple server hardware.

QTSS is similar in design and configuration to Apache, the popular web server software that is also included in Mac OS X Server. If you have experience working with Apache, QTSS will seem familiar.

If you have administered a QuickTime streaming server using the web-based application Web Admin, you can continue to do so. Web Admin is useful for administering a streaming server remotely or from non-Macintosh computers. For more information, see “Using the Web-Based Application to Manage QuickTime Streaming” on page 25. Server Admin for Mac OS X Server includes options for accomplishing the tasks you performed with Web Admin.

## What's New in QTSS for Mac OS X Server Version 10.5

Built into Mac OS X Server v10.5 is QuickTime Streaming Server 6, Apple's industrial strength, standards-based streaming server with improvements in mobile delivery, Mac OS X Server integration, and standards support. QTSS 6 delivers these enhancements:

- **3GPP Release 6 support:** QuickTime Streaming Server 6 has been updated to include support with the latest version of the 3GPP specification (Release 6), providing increased compatibility with mobile devices worldwide.
- **3GPP Release 6 bit rate adaption:** QuickTime Streaming Server 6 delivers support for 3GPP Release 6 bit rate adaption providing the smoothest streaming experience to mobile devices even during times of network congestion.
- **Open Directory support:** QuickTime Streaming Server 6 allows you to restrict access to streaming content using the users and groups through Workgroup Manager in Mac OS X Server.
- **64-bit operation:** QuickTime Streaming Server 6 supports native 64-bit operation.

Other features of QTSS include:

- **Native 3GPP:** Stream industry-standard 3GPP files to any compliant 3GPP player device.
- **Native MPEG-4 streaming:** Stream ISO-compliant, hinted MPEG-4 files to any ISO-compliant MPEG-4 player, or device.
- **MP3 audio streaming:** Create your own Internet radio station. You can serve standard MP3 files using Icecast-compatible protocols over HTTP. Build a playlist of MP3 files and serve them to MP3 clients such as iTunes and WinAmp for a simulated live experience.
- **Skip protection:** Apple skip-protection technology—a collection of quality-of-service features—takes advantage of available bandwidth to ensure the smoothest possible playback.
- **Instant-On:** Viewers with a broadband connection watching a streaming video with QuickTime 6 and later will benefit from Instant-On, an advance that provides enhanced overbuffering of data, resulting in dramatically reduced buffer time. With Instant-On, broadband users can also scrub forward and back with the time slider through an on-demand media stream and have playback updated instantly.
- **Authentication:** Digest and basic authentication, as well as directory services authentication, let you control access to protected media.
- **Support for streaming HD movies:** QTSS can stream thousands of simultaneous movies encoded at 1280x720, 24p, 5mbps from a single Xserve computer.
- **H.264 streaming support:** QTSS supports streaming of live and on-demand content encoded with the H.264 video codec, which is included with QuickTime.
- **QuickTime Broadcaster:** Included with Mac OS X Server, QuickTime Broadcaster provides end-to-end support for MPEG-4 Internet broadcasting.
- **Server-side playlists:** You can stream a set of media files as if it were a live broadcast. This can be ideal for creating and managing a virtual radio or television station.
- **Relay support:** You can easily set up several layers of servers to broadcast streams to a virtually unlimited number of clients.



## The QuickTime Suite of Products

The QuickTime suite of products is unique in that it provides all the software you need to produce, transmit, and receive streamed media. Each product is designed for optimum compatibility with all the other components in the suite.

The QuickTime suite comprises the following products:

- **QuickTime Player:** The free QuickTime Player is an easy-to-use application for playing, interacting with, or viewing any video, audio, virtual reality (VR), or graphics file that is compatible with QuickTime.
- **QuickTime Pro:** The powerful pro version of QuickTime Player provides an abundance of media authoring capabilities. You can capture audio and video, create slideshows, encode video and audio, edit movie tracks, create hint tracks, create media skins, and assemble hundreds of different media types into one movie file.
- **QuickTime Streaming Server (QTSS):** Included with Mac OS X Server, QTSS software enables you to deliver live and on-demand media in real time using industry standard protocols over the Internet with no per-stream license fees. Users see streamed media as soon as it reaches the computer; they don't have to wait to download files.
- **Darwin Streaming Server: (DSS)** This free, open-source version of QTSS supports popular enterprise platforms such as Linux, Windows Server 2003 and Solaris. It is available for download in source code form and can be compiled on a variety of platforms by modifying a few platform-specific source files.

## What's in This Guide

This guide includes the following chapters:

- Chapter 1, “Overview of QuickTime Streaming,” explains streaming concepts and terms.
- Chapter 2, “Setting Up Your QuickTime Streaming Server,” lists hardware and software requirements, and provides instructions for setting up and testing your streaming server.
- Chapter 3, “Managing Your QuickTime Streaming Server,” provides step-by-step instructions for using the Server Admin application to administer and monitor a streaming server locally or remotely.
- Chapter 4, “Troubleshooting and Technical Information,” describes common problems and provides information on what to do if you encounter problems while streaming media.
- Chapter 5, “Working with QuickTime Broadcaster,” provides information about using Apple’s award-winning software for professionally broadcasting live events.
- Chapter 6, “Setup Example,” provides information about the key components needed for a generic webcasting setup.

In addition, the Glossary provides brief definitions of terms used in QuickTime Streaming and in this guide.

**Note:** Because Apple frequently releases new versions and updates to its software, images shown in this book may be different from what you see on your screen.

## Using Onscreen Help

You can get task instructions onscreen in the Help Viewer application while you’re managing Leopard Server. You can view help on a server or an administrator computer. (An administrator computer is a Mac OS X computer with Leopard Server administration software installed on it.)

### To get help for an advanced configuration of Leopard Server:

- Open Server Admin or Workgroup Manager and then:
  - Use the Help menu to search for a task you want to perform.
  - Choose Help > Server Admin Help or Help > Workgroup Manager Help to browse and search the help topics.

The onscreen help contains instructions taken from *Server Administration* and other advanced administration guides described in “Mac OS X Server Administration Guides,” next.

**To see the most recent server help topics:**

- Make sure the server or administrator computer is connected to the Internet while you're getting help.

Help Viewer automatically retrieves and caches the most recent server help topics from the Internet. When not connected to the Internet, Help Viewer displays cached help topics.

## Mac OS X Server Administration Guides

*Getting Started* covers installation and setup for standard and workgroup configurations of Mac OS X Server. For advanced configurations, *Server Administration* covers planning, installation, setup, and general server administration. A suite of additional guides, listed below, covers advanced planning, setup, and management of individual services. You can get these guides in PDF format from the Mac OS X Server documentation website:

[www.apple.com/server/documentation](http://www.apple.com/server/documentation)

This guide ...	tells you how to:
<i>Getting Started and Mac OS X Server Worksheet</i>	Install Mac OS X Server and set it up for the first time.
<i>Command-Line Administration</i>	Install, set up, and manage Mac OS X Server using UNIX command-line tools and configuration files.
<i>File Services Administration</i>	Share selected server volumes or folders among server clients using the AFP, NFS, FTP, and SMB protocols.
<i>iCal Service Administration</i>	Set up and manage iCal shared calendar service.
<i>iChat Service Administration</i>	Set up and manage iChat instant messaging service.
<i>Mac OS X Security Configuration</i>	Make Mac OS X computers (clients) more secure, as required by enterprise and government customers.
<i>Mac OS X Server Security Configuration</i>	Make Mac OS X Server and the computer it's installed on more secure, as required by enterprise and government customers.
<i>Mail Service Administration</i>	Set up and manage IMAP, POP, and SMTP mail services on the server.
<i>Network Services Administration</i>	Set up, configure, and administer DHCP, DNS, VPN, NTP, IP firewall, NAT, and RADIUS services on the server.
<i>Open Directory Administration</i>	Set up and manage directory and authentication services, and configure clients to access directory services.
<i>Podcast Producer Administration</i>	Set up and manage Podcast Producer service to record, process, and distribute podcasts.
<i>Print Service Administration</i>	Host shared printers and manage their associated queues and print jobs.
<i>QuickTime Streaming and Broadcasting Administration</i>	Capture and encode QuickTime content. Set up and manage QuickTime streaming service to deliver media streams live or on demand.

This guide ...	tells you how to:
<i>Server Administration</i>	Perform advanced installation and setup of server software, and manage options that apply to multiple services or to the server as a whole.
<i>System Imaging and Software Update Administration</i>	Use NetBoot, NetInstall, and Software Update to automate the management of operating system and other software used by client computers.
<i>Upgrading and Migrating</i>	Use data and service settings from an earlier version of Mac OS X Server or Windows NT.
<i>User Management</i>	Create and manage user accounts, groups, and computers. Set up managed preferences for Mac OS X clients.
<i>Web Technologies Administration</i>	Set up and manage web technologies, including web, blog, webmail, wiki, MySQL, PHP, Ruby on Rails, and WebDAV.
<i>Xgrid Administration</i>	Set up and manage computational clusters of Xserve systems and Mac computers.
<i>Mac OS X Server Glossary</i>	Learn about terms used for server and storage products.

## Viewing PDF Guides Onscreen

While reading the PDF version of a guide onscreen:

- Show bookmarks to see the guide's outline, and click a bookmark to jump to the corresponding section.
- Search for a word or phrase to see a list of places where it appears in the document. Click a listed place to see the page where it occurs.
- Click a cross-reference to jump to the referenced section. Click a web link to visit the website in your browser.

## Printing PDF Guides

If you want to print a guide, you can take these steps to save paper and ink:

- Save ink or toner by not printing the cover page.
- Save color ink on a color printer by looking in the panes of the Print dialog for an option to print in grays or black and white.
- Reduce the bulk of the printed document and save paper by printing more than one page per sheet of paper. In the Print dialog, change Scale to 115% (155% for *Getting Started*). Then choose Layout from the untitled pop-up menu. If your printer supports two-sided (duplex) printing, select one of the Two-Sided options. Otherwise, choose 2 from the Pages per Sheet pop-up menu, and optionally choose Single Hairline from the Border menu. (If you're using Mac OS X v10.4 or earlier, the Scale setting is in the Page Setup dialog and the Layout settings are in the Print dialog.)

You may want to enlarge the printed pages even if you don't print double sided, because the PDF page size is smaller than standard printer paper. In the Print dialog or Page Setup dialog, try changing Scale to 115% (155% for *Getting Started*, which has CD-size pages).

## Getting Documentation Updates

Periodically, Apple posts revised help pages and new editions of guides. Some revised help pages update the latest editions of the guides.

- To view new onscreen help topics for a server application, make sure your server or administrator computer is connected to the Internet and click "Latest help topics" or "Staying current" in the main help page for the application.
- To download the latest guides in PDF format, go to the Mac OS X Server documentation website:  
[www.apple.com/server/documentation](http://www.apple.com/server/documentation)

## Getting Additional Information

For more information, consult these resources:

- *Read Me documents*—important updates and special information. Look for them on the server discs.
- *Mac OS X Server website* ([www.apple.com/server/macosx](http://www.apple.com/server/macosx))—gateway to extensive product and technology information.
- *Mac OS X Server Support website* ([www.apple.com/support/macosxserver](http://www.apple.com/support/macosxserver))—access to hundreds of articles from Apple's support organization.
- *Apple Discussions website* ([discussions.apple.com](http://discussions.apple.com))—a way to share questions, knowledge, and advice with other administrators.
- *Apple Mailing Lists website* ([www.lists.apple.com](http://www.lists.apple.com))—subscribe to mailing lists so you can communicate with other administrators using email.
- *The QuickTime Streaming Server products website*—the latest information on key features, recent downloads, and minimum requirements, with links to additional support pages.  
[www.apple.com/quicktime/streamingserver](http://www.apple.com/quicktime/streamingserver)
- *QuickTime for the Web*—an excellent Apple QuickTime Developer Series book that explains how to integrate video, recorded sound, Flash animation, virtual reality, MIDI, text, still images, live streams, games, and user interactivity into a website. The companion disc includes QuickTime Pro and a full set of development tools for both Windows and Macintosh. Published by Morgan Kaufmann, this award-winning book is featured with other useful titles on the QuickTime instructional website.  
[www.apple.com/quicktime/tools\\_tips/books.html](http://www.apple.com/quicktime/tools_tips/books.html)
- *The QuickTime Services website*—lists of streaming service providers.  
[www.apple.com/quicktime/resources](http://www.apple.com/quicktime/resources)
- *Internet Engineering Task Force (IETF) website*—Request for Comments (RFC) and memorandums on the RTP and RTSP standards.  
[www.ietf.org/rfc/rfc1889.txt](http://www.ietf.org/rfc/rfc1889.txt) (RTP)  
[www.ietf.org/rfc/rfc2326.txt](http://www.ietf.org/rfc/rfc2326.txt) (RTSP)
- *The public source website*—access to Darwin Streaming Server source code, developer information, and FAQs.  
[developer.apple.com/darwin/projects/streaming](http://developer.apple.com/darwin/projects/streaming)

Before you set up your QuickTime Streaming Server, learn what streaming is.

## What Streaming Is

Streaming is the delivery of media, such as movies and live presentations, over a network in real time. A computer (a streaming server) sends the media to another computer (a client computer), which plays the media as it is delivered.

With streaming, no files are downloaded to the viewer's hard disk. You can stream media at various rates, from modem to broadband.

Just as you need a web server to host a website, to send streams over the Internet or a local network you need a streaming server, which transmits video and audio streams on request.

For small audiences, the same computer can run web server software, mail server software, and streaming server software. For larger audiences, one or more computers are typically dedicated as streaming servers.

When a user requests a stream (using client software such as QuickTime Player), the request is handled using Real-Time Streaming Protocol (RTSP). Streams are sent using Real-Time Transport Protocol (RTP). A streaming server can create streams from QuickTime movies stored on a disk, and can transmit live streams to which it has access.

With QuickTime Streaming Server (QTSS) software, you can deliver:

- Broadcasts of live events in real time
- Video on demand
- Playlists of prerecorded content

## Live Versus On-Demand Delivery

Real-time streaming media is delivered in two ways: live and on demand. QuickTime Streaming Server delivers both.

Live events, such as concerts, speeches, and lectures, are commonly streamed over the Internet as they happen, using broadcasting software such as QuickTime Broadcaster. Broadcasting software encodes a live source, such as video from a camera, in real time and delivers the resulting stream to the server. The server then serves, or “reflects,” the live stream to clients. Regardless of when people connect to the stream, everyone sees the same point in the stream at the same time. You can simulate a live experience with recorded content by broadcasting from an archive source such as a tape deck or by creating playlists of media on the server.

With on-demand delivery, such as a movie or an archived lecture, each customer initiates the stream from the beginning, so no one comes in late to the stream. No broadcasting software is required for on-demand delivery.

## Progressive Download (HTTP) Delivery Versus Streaming (RTP/RTSP) Delivery

Progressive download (sometimes called “Fast Start”) is a method of delivering a movie over the Internet so it can start playing before its file is fully downloaded. With progressive download, a movie has all the data needed to start playing it at the beginning of the file, so QuickTime can start to play the movie as soon as the first part of the file is transferred. Unlike streaming, where you can watch movies without downloading files, Fast Start movies are downloaded to the viewer’s computer.

A Fast Start movie can be self-contained, so all data is stored inside the movie itself, or it can include pointers to data on the Internet. You can watch progressive download movies in a web browser using the QuickTime plug-in or QuickTime Player.

You can create progressive download movies for viewers with various connection speeds (called reference movies) and a streaming movie for viewers with the fastest connections.

## Instant-On Streaming

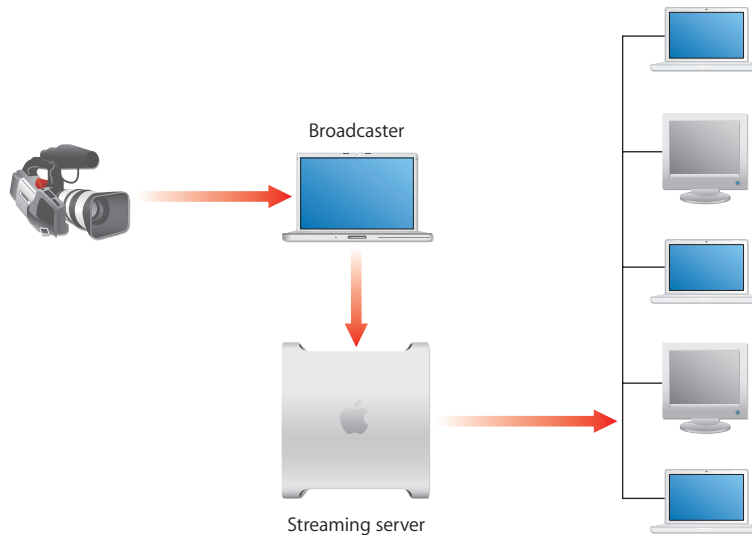
Viewers watching a streaming video with QuickTime 6 and later will benefit from Instant-On, an advance in Apple skip-protection technology that dramatically reduces buffer, or wait, time for an instantaneous viewing experience. Viewers can click around or scrub video as if it were on their hard disks.

To experience Instant-On streaming, users must have a broadband connection. The responsiveness of Instant-On streaming is affected by available bandwidth and the size, or data rate, of the content. Responsiveness can also be affected by the codec used.



## Simple Setup for Live Video

The illustration below shows a setup for streaming live video and audio. (Most video cameras have a built-in microphone.) You can stream audio only by using a microphone, mixer, and other appropriate audio equipment.



A MacBook Pro with QuickTime Broadcaster software captures and encodes video and audio. The encoded signal is sent over an Internet Protocol (IP) network to a server running QTSS software. QTSS on the server sends the signal over the Internet or a local network to client computers that request the stream using QuickTime Player.

You can also run QuickTime Broadcaster and QTSS on the same computer. If you are broadcasting to a large audience (more than, say, 100), however, it's wise to run QuickTime Broadcaster and QTSS on separate computers.

## Ways to Receive Streamed Media

When you watch and listen to cable or over-the-air media transmissions on television or radio, the cable or electromagnetic wavelengths used are dedicated to that transmission. Those transmissions are mostly uncompressed and require large amounts of transmission bandwidth. It's not a problem, because they don't compete with other transmissions using the same frequency they're broadcast over.

When you send that same media over the Internet, the bandwidth used is no longer dedicated to only that transmission stream. The media must now share extremely limited bandwidth with thousands, potentially millions, of other transmissions traveling over the Internet.

Therefore, before multimedia is sent over the Internet, it is encoded and compressed for transmission. The resulting files are saved in a specific location, and streaming server software such as QTSS sends the media over the Internet to client computers.

Macintosh and Windows users can view streamed media with QuickTime Player (available free on the Apple website) or any other application that supports QuickTime or standard MPEG-4 files.

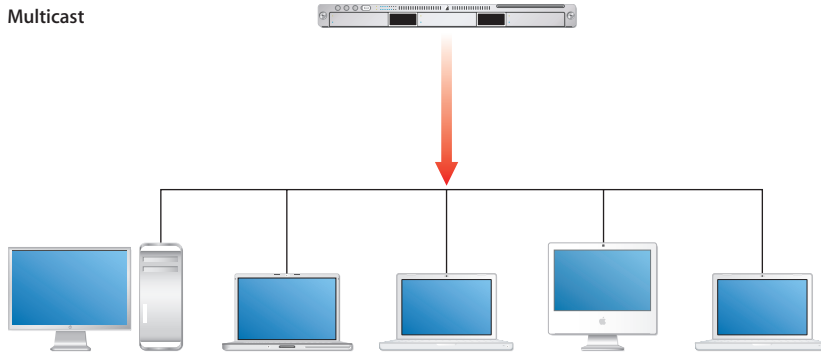
You can also set up streams that users can view in a web browser but they must have the QuickTime plug-in installed. When a user starts to play streamed media on a webpage, the QuickTime plug-in sends a request to the streaming server, and the server responds by sending the multimedia content to the client computer. You specify on the webpage what content to send to the client—a QuickTime movie in a specified directory, a live broadcast, or a playlist on the streaming server. You can also view 3GP streams on streaming-enabled cell phones.

## Multicast Versus Unicast

QTSS supports multicast and unicast network transport to deliver streaming media.

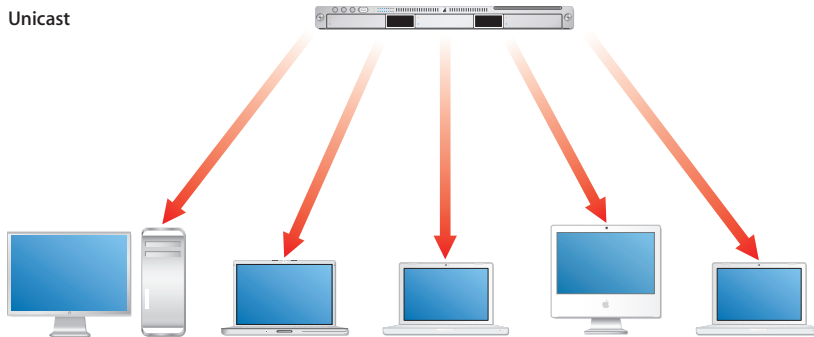
In a multicast, a single stream is shared among the clients (see illustration below). Each client tunes in to the stream much as a radio tunes in to an FM broadcast. This technique reduces network congestion but it requires a network that has access to the multicast backbone (Mbone) for content distributed over the Internet, or that is multicast-enabled for content distributed on a contained private network.

Multicast



In a unicast, each client initiates its own stream, resulting in the generation of many one-to-one connections between client and server (see illustration below). Having many clients connected via unicast to a stream in a local network can cause heavy network traffic, but this technique is the most reliable for delivery over the Internet because no special transport support is required.

Unicast



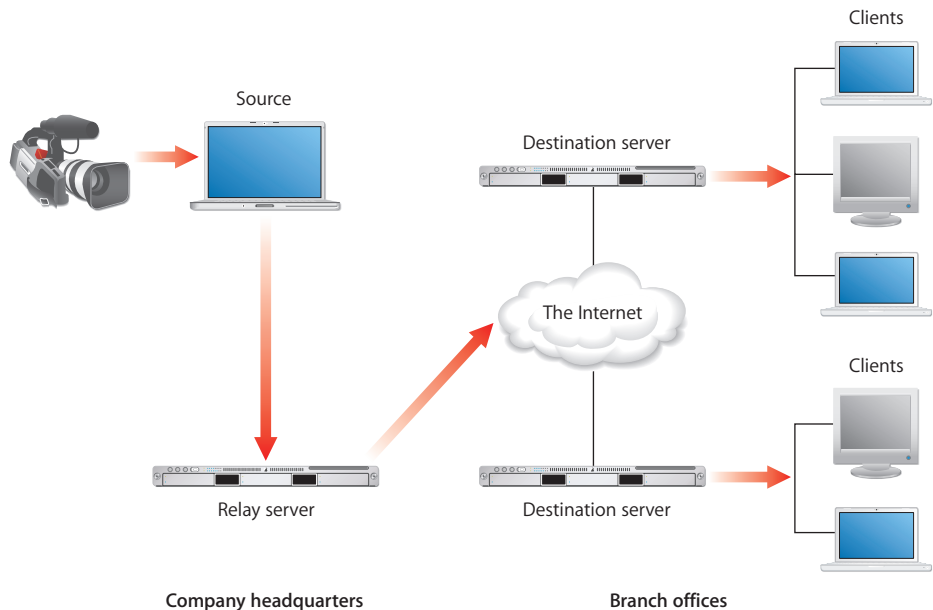
## Relays

Relays are useful for broadcasts with numerous viewers in different locations. QTSS can function as a relay sever, allowing you to scale streaming infrastructure by distributing the load between servers and making the most efficient use of network bandwidth.

When used as a relay server, QTSS forwards a stream from a source (such as Live Broadcaster, QuickTime Streaming Server) to a destination server. Mainly used for live streaming, relays are most commonly set up when viewers of the live broadcast are in multiple locations, such as different buildings on a campus or in different countries.

The source server generally resides where the live broadcast is occurring and forwards the stream to servers in various locations.

For example, a company can broadcast a CEO's presentation by relaying it from headquarters to branch offices.



In this scenario, only a single stream goes over the open Internet and viewers in the branch offices connect to the destination servers on the local area network (LAN), thus reducing the load on the source server and creating a better viewing experience for everyone.

For details about setting up relays, see "Setting Up Relay Streams" on page 28.

# Setting Up Your QuickTime Streaming Server

# 2

This chapter helps you quickly get QuickTime Streaming Server up and running.

The instructions in this chapter assume that you have installed and set up Mac OS X Server version 10.5. For instructions on setting up Mac OS X Server, see *Mac OS X Server Getting Started for Version 10.5 or Later*, included on a Mac OS X Server installation disc and downloadable at [www.apple.com/server/documentation](http://www.apple.com/server/documentation).

## Hardware and Software Requirements for QuickTime Streaming

QTSS requirements are provided in the *Getting Started* guide.

### Viewer Computer Requirements

Any computer with QuickTime 4 or later installed can view media streamed by the streaming server. For best results, Apple recommends QuickTime 7 or later.

To take advantage of Instant-On using QuickTime Streaming Server 4.1 or later, QuickTime 6 or later and a broadband Internet connection are required.

Any ISO-compliant MPEG-4 player can view MPEG-4 files and any 3GP-compliant device can view 3GP files. Streaming MP3 playlists can be listened to using iTunes or other compatible streaming MP3 player such as WinAmp.

You can download QuickTime Player software from the QuickTime website: [www.apple.com/quicktime](http://www.apple.com/quicktime)

### Live Broadcasting Requirements

To broadcast live content, use QuickTime Broadcaster, which is included and installed with Mac OS X Server.

To stream live audio or video, you need the following equipment:

- Source equipment for audio, video, or both, such as a VCR, video camera, and microphone
- A computer with QuickTime Broadcaster or other broadcast software (G4 computer or better recommended for MPEG-4 broadcasting) and a video or audio capture card

**Note:** QuickTime Broadcaster supports video capture from most FireWire-equipped sources, including digital video (DV) cameras, some webcams, and DV converter boxes for a fast, easy broadcasting process with professional-quality results.

- 128 MB of RAM (256 MB recommended for professional broadcasting)
- QuickTime 6 or later

## Bandwidth Considerations

It's generally not a good idea to connect a streaming server to the Internet or local area network (LAN) by Digital Subscriber Line (DSL) or cable modem. The server will be severely limited by the relatively small bandwidth of DSL and cable modems for uploading data. In some cases, running a server on a DSL connection can break a DSL service agreement. Before setting up the server, consult your DSL or cable modem service provider.

When authoring Real-Time Transport Protocol (RTP) streams, you'll get best performance if the streams don't exceed 75 percent of anticipated client bandwidth. For example, don't use a rate higher than 21 kilobits per second (Kbps) for a 28 Kbps modem connection. For a typical 56K modem connection, don't use a rate higher than 40 Kbps. For a T1 (1500 Kbps) client connection, don't use a rate higher than 1125 Kbps.

## Setting Up Your Streaming Server

You can set up your streaming server, test your setup, and access media streamed from your server.

**To set up your streaming server:**

- 1 Open Server Admin.
- 2 In the Services list, select the computer you want to set up as a QuickTime streaming server.
- 3 Click General Settings in the toolbar, then click the Services tab.
- 4 In the services list, select QuickTime Streaming and then click Save.
- 5 Select QuickTime Streaming in the Servers list to view and change settings.
- 6 To start the QuickTime Streaming service, click the Play button near the bottom-left corner of the Server Admin window.

## Testing Your Setup

Sample QuickTime movies are included with QTSS in the default movie folder so you can test the server setup. The sample movies can be viewed using QuickTime Player.

**Note:** The included sample MP3 file is for use in a streaming MP3 playlist only. It cannot be streamed on demand using RTSP because it hasn't been prepared for streaming, which requires a process called hinting.

### To test your server setup by viewing a sample movie:

- 1 On another computer, open QuickTime Player.
- 2 Choose File > Open URL in New Player.
- 3 Enter the following URL:

```
rtsp://hostname/sample_300kbit.mov
```

Replace `hostname` with the host name or IP address of the QuickTime streaming server and choose the movie with the bit rate appropriate for your bandwidth.

- 4 Click OK.

QuickTime Player connects with the server and plays the movie in a new window.

If you see a "File not found" message, make sure you typed the URL correctly, including uppercase and lowercase.

If your streaming server is multihomed (for example, if the computer also hosts a web server), you may need to specify another IP address for streaming. (A web server uses port 80; with certain QuickTime client configurations, QTSS also uses port 80.)

You can choose or add an IP address for the streaming server in the QuickTime Streaming pane of Server Admin. Click Settings, click IP Bindings, and then click the Bind checkbox for the desired IP address.

This concludes the initial setup of your QTSS software. Additional settings depend on your hardware and software, network connections, expected number of viewers, and media you want to stream.

For information about determining these settings and operating your streaming server, see Chapter 3, "Managing Your QuickTime Streaming Server," Chapter 6, "Setup Example," and the resources listed on page 14.

## Accessing Media Streamed from Your Server

To view streaming media, users must have QuickTime 4 or later (or an MP4 player). Following are the instructions to provide to users who want to view media streamed from your server.

### To view streamed media:

- 1 Open QuickTime Player.
- 2 Choose File > Open URL.
- 3 Enter the URL for the media file.

Example: `rtsp://myserver.com/mymedia`

Replace `myserver.com` with the DNS name of the QTSS computer and `mymedia` with the name of the hinted movie or media file.

This URL assumes that the movie or media file is at the top level of the media directory. For movies in subfolders in the media directory, add the folder to the pathname. For example:

`rtsp://myserver.com/myfolder/mymedia.mov`

If you want users to view streamed media through a web browser, you must set up a webpage to show the media and give users the page's URL.

**Note:** Typing an RTSP URL directly into the web browser's address field is not recommended (because some web browsers don't recognize "rtsp").



This chapter provides information about streaming through firewalls, setting up relays, and administering a QuickTime Streaming Server remotely.

To set up and manage QuickTime Streaming Server (QTSS), you use the Server Admin application, which is installed with Mac OS X Server (version 10.5 or later). This application provides a standard user interface for all supported platforms and enables you to administer the streaming server locally or remotely.

You use Server Admin to change general settings, monitor connected users, view log files, manage bandwidth usage, and relay streams from one server to another.

## Using the Web-Based Application to Manage QuickTime Streaming

If you have previously administered a QuickTime streaming server using Web Admin you can continue to do so. Web Admin, a web-based application, is useful for administering a streaming server remotely or from non-Macintosh computers.

### To enable Web Admin:

- 1 In Server Admin, select QuickTime Streaming under the server in the Servers list.
- 2 Click Settings.
- 3 Click Access.
- 4 Select “Enable web-based administration,” then enter a name and password to be used for accessing the administrative website.
- 5 Click Save.

For information on using Web Admin, see the QuickTime streaming server/Darwin Streaming Server administrator’s guide available at [developer.apple.com/darwin/](http://developer.apple.com/darwin/).

**Note:** If you’ve used Web Admin to administer a QuickTime Streaming Server, you’ll find the administration features in Mac OS X Server Admin.

## Using Server Admin to Manage QuickTime Streaming

This section provides instructions for using Server Admin to complete such tasks as streaming, setting up a multihomed server, and changing such settings as the maximum number of connections and the maximum throughput allowed.

### Starting or Stopping Streaming Service

You start or stop streaming service in the QuickTime Streaming pane of Server Admin.

**To start or stop streaming service:**

- 1 Open Server Admin.
- 2 In the Servers list, click QuickTime Streaming for the server.
- 3 At the top of the window, click Start Service or Stop Service.

### Changing the Maximum Number of Stream Connections

When the specified maximum number of connections is reached, users who try to connect see a message that the server is busy or there is not enough bandwidth (error 453).

**To change the maximum number of connections:**

- 1 In Server Admin, click QuickTime Streaming under the server in the Servers list.
- 2 Click Settings.
- 3 Enter a number in the Maximum Connections text field.
- 4 Click Save.

## Changing the Maximum Streaming Throughput

If the maximum throughput is reached, no one else can connect. Users who try to connect see a message that the server is busy (error 453).

### To change the maximum throughput:

- 1 In Server Admin, click QuickTime Streaming under the server in the Computers & Services list.
- 2 Click Settings.
- 3 Enter a number in the Maximum Throughput text field, and choose megabits per second (Mbps) or kilobits (Kbps) from the pop-up menu.

You can specify whether to bind QTSS to all listed IP addresses or only to selected addresses.

- 4 Click Save.

## Changing the Streaming Media Directory

QuickTime Streaming Server has one main media directory (/Library/QuickTimeStreaming/Movies/). If you need to, you can specify another directory for your streaming media. For example, you might want to switch the directory to another hard disk. Make sure the owner of the new directory is the system user “qtss.” The owner can be changed from Workgroup Manager, the Finder, or the command line.

### To specify another media directory:

- 1 In Server Admin, click QuickTime Streaming under the server in the Servers list.
- 2 Click Settings.
- 3 Enter a pathname in the Media Directory text field or click the button next to the field to choose a folder.
- 4 Click Save.

## Binding the Streaming Server Admin Computer to an IP Address

If your streaming server admin computer is multihomed (for example, if you’re also hosting a web server), you can specify what IP address QTSS should bind to.

### To specify an IP address:

- 1 In Server Admin, click QuickTime Streaming under the server in the Servers list.
- 2 Click Settings, then click IP Bindings.
- 3 Select the Bind checkbox for the IP address.
- 4 Click Save.

## Hosting Streams from Multiple User Media Directories

QTSS can have only one main media directory. However, by enabling home directory support users can stream on-demand files or playlists from their home directory.

**To configure QTSS to stream movies from users' home directories:**

- 1 In Server Admin, click QuickTime Streaming.
- 2 Click Settings, then click Access.
- 3 Select "Enable home directory streaming."
- 4 Click Save.
- 5 Ask users to put their hinted QuickTime movies into the folder that was created in their home directories (`/<username>/Sites/Streaming`).

To view a movie in a private movie directory, enter:

```
rtsp://hostname.com/~user1/sample.mov
```

**Note:** To stream a live broadcast from a directory other than the media directory, you must create a `qtaccess` file. For more information, see the *QuickTime Streaming Server Administrator's Guide* available at [developer.apple.com/darwin/](http://developer.apple.com/darwin/).

## Setting Up Relay Streams

You use relays to accept a stream from one streaming server and send the stream, or relay it, to another streaming server. Each relay comprises a source and one or more destinations.

**To set up a relay:**

- 1 In the Settings pane of the QuickTime Streaming service, click Relays.
- 2 Click the Add (+) button next to the Relays list.
- 3 Enter a name for the relay in the Relay Name field.
- 4 Choose an option from the Relay Type pop-up menu.

The Relay Type defines the source for the relay. There are three options:

- **Request Incoming Stream** directs the streaming server to send a request to the source computer for the incoming stream before it gets relayed. You can use this feature to relay a reflected live broadcast (from another server) or to request a stored file and turn it into an outgoing live stream. Request Incoming Stream is commonly used with unannounced UDP streams from QuickTime Broadcaster or other streaming encoders.
- **Unannounced UDP** directs the server to relay streams on a specific IP address and port numbers.

- **Announced UDP** directs the server to wait for the incoming stream and then relay it. Relays set to wait for announced streams can accept only media streams using the RTSP announce protocol. Announced UDP is used with Automatic (Announced) broadcasts from QuickTime Broadcaster or other streaming encoders that support the RTSP announce protocol.
- 5 In case of a Request Incoming Stream or Announced UDP, in the Source IP field, enter the DNS hostname or IP address of the source computer.
  - 6 In case of a Request Incoming Stream or Announced UDP, in the Path text field, enter the pathname to the stream.
  - 7 In case of a Request Incoming Stream or Announced UDP, if the source computer requires automatic broadcasts to be authenticated, enter a user name and password.
  - 8 Make sure Enable Relay is selected and click the Back button.
  - 9 Click the Add (+) button next to the Destinations list.  
There are two different types of destinations:
    - Unannounced UDP directs the server to relay the stream to the destination IP address and port numbers. This requires generating an sdp file manually.
    - Announced UDP directs the server to relay and announce the stream to the destination IP address. The sdp file is generated at the destination.
  - 10 Enter the requested information and click the Back button.
  - 11 Repeat steps 9 and 10 for each destination, then click Save.

To turn a relay on or off, select or deselect the Enable checkbox next to the relay in the list. To delete a relay, select it and click the Delete (–) button.

## Changing QuickTime Streaming Log Settings

You can specify that each log be reset after a certain number of days.

**To change log settings:**

- 1 In Server Admin, click QuickTime Streaming under the server in the Servers list.
- 2 Click Settings.
- 3 Click Logging.

The Access Log is updated only as client connections are disconnected. Connected clients at the time of a power failure or server crash are never logged and won't appear in the Access Log when the server restarts.

Log files are stored in /Library/QuickTimeStreaming/Logs/.

## Reading QuickTime Streaming Logs

QTSS provides the following log files:

- **Error logs.** These log files record errors such as configuration problems. For example, if you bind to a specific IP address that can't be found, or a if user deletes streaming files, these items are logged.
- **Access logs.** When someone plays a movie streamed from your server, the log reports such information as the date, time, and IP address of the computer that played the movie.

QTSS log files are stored in /Library/QuickTimeStreaming/Logs.

QTSS keeps its logs in standard W3C format allowing you to use a number of popular log analysis tools to parse the data.

## Security and Access

A certain level of security is inherent in real-time streaming because content is delivered only as the client needs it and no files remain afterward. However, you may need to address some security issues.

The streaming server uses the IETF standard RTSP/RTP protocols. RTSP runs on top of TCP and RTP runs on UDP. Many firewalls are configured to restrict TCP packets by port number, and are very restrictive on UDP.

There are three options for streaming through firewalls with QTSS. These options are not mutually exclusive. Typically one or more are used to provide the most flexible setup. The three configurations outlined below are for clients behind a firewall.

- **Stream via port 80.** This option enables the streaming server to encapsulate all RTSP and RTP traffic inside TCP port 80 packets. Because this is the default port used for HTTP-based web traffic, the streamed content gets through most firewalls. However, encapsulating the streaming traffic lowers performance on the network and requires faster client connections to maintain streams. It also increases load on the server.
- **Open the appropriate ports on the firewall.** This option allows the streaming server to be accessed via RTSP/RTP on the default ports, and provides better use of network resources, lower speeds for client connections, and less load on the server. The ports that must be open include:
  - TCP port 80: Used for signaling and streaming RTSP/HTTP (if enabled on server).
  - TCP port 554: Used for RTSP.
  - UDP ports 6970–9999: Used for UDP streaming. A smaller range of UDP ports, typically 6970–6999, can usually be used.
  - TCP port 7070: Optionally used for RTSP. (Real Server uses this port; QTSS/Darwin can also be configured to use this port.)
  - TCP ports 8000 and 8001: Can be opened for Icecast MP3 streaming.

- **Set up a streaming proxy server.** The proxy server is placed in the network DMZ—an area on the network that is between an external firewall that connects to the Internet and an internal firewall between the DMZ and the internal network. Using firewall rules, packets with the ports defined above are allowed from the proxy server to clients through the internal firewall, and also between the proxy server and the Internet via the external firewall. However, clients are not allowed to make direct connections to external resources over those ports. This approach ensures that all packets bound for the internal network come through the proxy server, providing an additional layer of network security.

## Serving Streams Through Firewalls Using Port 80

If you are setting up a streaming server on the Internet and some of your clients are behind firewalls that allow only web traffic, enable streaming on port 80.

With this option, the streaming server accepts connections on port 80, the default port for web traffic, and QuickTime clients can connect to your streaming server even if they are behind a web-only firewall.

If you enable streaming on port 80, make sure you disable any web server with the same IP address to avoid conflicts with your streaming server.

### To serve QuickTime streams over HTTP port 80:

- 1 In Server Admin, click QuickTime Streaming under the server in the Servers list.
- 2 Click Settings.
- 3 Click IP Bindings.
- 4 Select “Enable streaming on port 80.”

**Important:** If you enable streaming on port 80, make sure your server is not also running a web server, such as Apache. Running QTSS and a web server with streaming on port 80 enabled can cause a port conflict that results in one or both servers not behaving properly.

## Streaming Through Firewalls or Networks with Address Translation

The streaming server sends data using UDP packets. Firewalls designed to protect information on a network often block UDP packets. As a result, client computers located behind a firewall that blocks UDP packets can’t receive streamed media.

However, the streaming server also allows streaming over HTTP connections, which allows streamed media to be viewed through even very tightly configured firewalls.

Some client computers on networks that use address translation may be unable to receive UDP packets, but they can receive media that’s streamed over HTTP connections.

If users have problems viewing media through a firewall or via a network that uses address translation, have them upgrade their client software to QuickTime 5 or later. If users still have problems, have their network administrators provide them with the appropriate settings for the streaming proxy and streaming transport settings on their computers.

Network administrators can also set firewall software to permit RTP and RTSP throughput.

## Changing the Password Required to Send an MP3 Broadcast Stream

Broadcasting MP3s to another server requires authentication.

### To change the MP3 broadcast password:

- 1 In Server Admin, click QuickTime Streaming under the server in the Servers list.
- 2 Click Settings, then click Access.
- 3 Enter a new password in the MP3 Broadcast Password box.
- 4 Click Save.

## Using Automatic Unicast (Announce) with QTSS on a Separate Computer

You can broadcast from QuickTime Broadcaster to QTSS. This setting can also be used to receive Announced UDP streams from another QuickTime streaming server via a relay using the Automatic Unicast (Announce) transmission method. To do so, you must create a broadcast user name and password on the streaming server.

### To create a broadcast user name and password on the streaming server:

- 1 In Server Admin, click QuickTime Streaming under the server in the Servers list.
- 2 Click Settings, then click Access.
- 3 Click the “Accept incoming broadcasts” checkbox.
- 4 Click Set Password and enter the name and password.
- 5 Click Save.

## Advanced Management Tasks

In addition to what is available via Server Admin, QTSS also includes advanced features that allow for further customization of the server from the command line. These features include creating QTSS users and groups with qtaccess files, controlling access to content, and setting up multicast relays.



## Controlling Access to Streamed Media

You can set up authentication to control client access to streamed media files. You can use Workgroup Manager to specify who can access the media files, or you can use an access file.

### To control access using Open Directory:

- Authorize each user in Workgroup Manager. See *Open Directory Administration* for more information.

### To control access using an access file:

Two schemes of authentication are supported: basic and digest. By default, the server uses the more secure digest authentication.

You can also control playlist access and administrator access to your streaming server. Authentication does not control access to media streamed from a relay server. The administrator of the relay server must set up authentication for relayed media.

The ability to manage user access is built into the streaming server, so it is always enabled.

For access control to work, an access file must be present in the directory you selected as your media directory. If an access file is not present in the streaming server media directory, all clients are allowed access to the media in the directory.

- 1 Use the `qtpasswd` command-line utility to create user accounts with passwords.
- 2 Create an access file and place it in the media directory you want to protect.
- 3 To disable authentication for a media directory, remove the access file (named `qtaccess`) or rename it (for example, `qtaccess.disabled`).

## Creating an Access File

An access file is a text file named `qtaccess` that contains information about users and groups who are authorized to view media in the directory where the access file is stored.

The directory you use to store streamed media can contain other directories, and each directory can have its own access file.

When a user tries to view a media file, the server checks for an access file to see whether the user is authorized to view the media. The server looks first in the directory where the media file is located. If an access file is not found, it looks in the enclosing directory.

The first access file that's found is used to determine whether the user is authorized to view the media file.

The access file for the streaming server works like the Apache web server access file.

You can create an access file with a text editor. The filename must be `qtaccess` and the file can contain some or all of the following information:

```
AuthName <message>
AuthUserFile <user filename>
AuthGroupFile <group filename>
require user <username1> <username2>
require group <groupname1> <groupname2>
require valid-user
require any-user
```

Terms not in angle brackets are keywords. Anything in angle brackets is information you supply.

Save the access file as plain text (not `.rtf` or any other file format).

Here's a brief explanation of each keyword:

- `message` is text your users see when the login window appears. It's optional. If your message contains white space (such as a space character between terms), enclose the entire message in quotation marks.
- `user filename` is the path and filename of the user file. For Mac OS X, the default is `/Library/QuickTimeStreaming/Config/qtusers`.
- `group filename` is the path and filename of the group file. For Mac OS X, the default is `/Library/QuickTimeStreaming/Config/qtgroups`. A group file is optional. If you have many users, it may be easier to set up one or more groups and then enter the group names, instead of listing each user.
- `username` is a user who is authorized to log in and view the media file. The user's name must be in the user file you specified. You can also specify `valid-user`, which designates any valid user.
- `groupname` is a group whose members are authorized to log in and view the media file. The group and its members must be listed in the group file you specified.

You can use these additional user tags:

- `valid-user` is any user defined in the `qtusers` file. The statement "require valid-user" specifies that any authenticated user in the `qtusers` file can have access to the media files. If this tag is used, the server prompts users for user name and password.
- `any-user` allows any user to view media without providing a name or password.
- `AuthScheme` is a keyword with the values "basic" or "digest" to a `qtaccess` file. This overrides the global authentication setting on a directory-by-directory basis.

If you make customized changes to the default `qtaccess` access file, be aware that making changes to broadcast user settings in Server Admin will modify the default `qtaccess` file at the root level of the movies directory. Therefore, customized modifications you made will not be preserved.

## What Clients Need When Accessing Protected Media

Users must have QuickTime 5 or later to access a media file that digest authentication is enabled for. If your streaming server is set up to use basic authentication, users need QuickTime 4.1 or later. Users must enter their user names and passwords to view the media file. Users who try to access a media file with an earlier version of QuickTime will see the error message “401: Unauthorized.”

## Adding User Accounts and Passwords

You can add a user account and password if you log in to the server computer.

### To add a user account:

- 1 Log in to the server computer as root, open a terminal window, and enter the following:

```
qtpasswd <user-name>
```

Alternatively, use `sudo` to execute the command as root.

- 2 Enter a password for the user and reenter it when prompted.

## Adding or Deleting Groups

You can edit the `/Library/QuickTimeStreaming/Config/qtgroups` file with any text editor as long the file uses this format:

```
<groupname>: <user-name1> <user-name2> <user-name3>
```

For Windows, the path is `c:\Program Files\Darwin Streaming Server\qtgroups`. For other supported platforms, it is `/etc/streaming/qtgroups`.

To add or delete a group, edit the group file you set up.

## Making Changes to the User or Group File

You can make changes to the user or group file if you log in to the server computer.

### To delete a user from a user or group file:

- 1 Log in to the server computer as administrator and use a text editor to open the user or group file.
- 2 Delete the user name and encrypted passwords line from the user file.
- 3 Delete the user name from the group file.

### To change a user password:

- 1 Log in to the server computer as root, open a terminal window, and enter the following:

```
qtpasswd <user-name>
```

Alternatively, use `sudo` to execute the command as root.

- 2 Enter a new password for the user.

The password you enter replaces the password in the file.

## Configuring a Multicast Relay

Setting up a multicast relay allows you to receive a unicast stream from one server and relay it out to a LAN over multicast. (Note that network must be multicast-enabled for viewers to be able to access the stream.) The following steps show how this is set up.

### To relay an incoming stream as a multicast stream:

- 1 Set up a multicast relay on the streaming server:
  - a If the broadcast source for the relay is configured as an Automatic Unicast (Announce), set the Relay Type to “Announced UDP.” If the broadcast source for the relay is configured as a Manual Unicast, set the Relay Type to “Request Incoming Stream.”
  - b Set the “Source IP” of the relay to 127.0.0.1.
  - c Set the path to the Announced (specified in step 2) or Unannounced sdp file (manually copied to the server) as the “Path” for the relay. This path is relative to your streaming server’s Movies directory. Make sure to include the “.sdp” extension.
  - d If you are using Automatic Unicast on the Broadcaster/Encoder, select “Announced UDP” for the Relay Type. If the source is a manual unicast, select “Request Incoming Stream.”
  - e Leave User Name and Password fields blank. When using the loopback address (127.0.0.1), authentication is not required.
  - f Create a destination for the relay by clicking the “+” icon, then specify a valid multicast address for the Destination IP address. Set the Destination type to “Unannounced UDP.” Set the UDP base port number to an even number (something in the 9000–9996 range works well). The multicast TTL is the number of router hops the multicast will work through, based on the topology of the network you are working on.
  - g Click the Save button.
- 2 Set up QuickTime Broadcaster to send an “Automatic Unicast (Announce)” or “Manual Unicast” to the server.

For Automatic Unicasts, the filename specified in Broadcaster will be created on the server (the .sdp extension will be added if not specified). More information on Automatic Unicast is available on page 32. For Manual Unicast, the sdp file must be Exported from Broadcaster and manually copied to the Streaming Server’s Movies directory.
- 3 After you start the broadcast, test the reflected stream from the server in QuickTime Player by opening this URL:  
`rtsp://<serverIP>/<filename.sdp>`

- 4 To enable clients to tune in to the multicast relay, make a copy of the SDP file and edit the copy as follows:
  - a In the line that begins with `c=IN IP4`, change the IP address to the multicast IP address specified in step 1.
  - b In the first line beginning with `m=` (usually `m=audio`), change the 0 to the base port specified in step 1 (for example, 9000).
  - c In the next line beginning with `m=` (usually `m=video`), change the 0 to the base port plus 2 (9002).
- 5 Save the file where clients can access it:
  - If you put the file on an HTTP or FTP server, clients can access the multicast in QuickTime Player by opening one of these URLs:
    - `http://<webServerIP>/<pathAndFileNameOfsdpFile>`
    - `ftp://<ftpServerIP>/<pathAndFileNameOfsdpFile>`
  - If you put the multicast SDP file on a web server or email it to clients, they can open it in QuickTime Player.
  - If you place the multicast SDP file on a web server, the MIME type needs to be configured properly on the web server by entering:

```
mime type extension application/sdp sdp
```

Alternatively, you can open the SDP file or URL in QuickTime Pro, save the file as a self-contained .mov file, and then send the file to clients or embed it in a webpage.

As long as the broadcast SDP filename isn't changed, you can stop and start broadcasts using the same name. However, if you change parameters in the SDP file, you must complete steps 4 and 5 for each new broadcast.



This chapter provides information on what to do if you encounter problems while streaming media.

## Using Log Files to Monitor Playlist Broadcasts

If you enable logging, you can use the log file to troubleshoot problems that occur during a broadcast. Here are tips for resolving problems you might find:

- If the media in the playlist is not being broadcast, use Server Admin to make sure the streaming server is running.
- If the streaming server is running, make sure a process called PlaylistBroadcaster is running on the server computer. If it is running, stop the broadcast, delete the SDP file for the broadcast from the streaming server media directory and then restart the broadcast. A new SDP file is generated when you restart the broadcast.

## If Media Files Don't Stream Properly

Try streaming a sample movie to see if the server can stream it. Sample movies are included with the server.

If the server streams the sample movie, the problem may be with the way your movie file is prepared. Re-create the movie.

If the sample movie doesn't stream, the problem may be with the server computer or the network. Verify the following:

- Check streaming server activity and, if necessary, reduce the maximum number of connections or throughput.
- If the problem occurs on a client computer, make sure the user has the appropriate Streaming Proxy and Streaming Transport settings. The administrator for the client computer's network should be able to provide the correct settings.
- Make sure the client software supports the file format being broadcast.

- Verify the structure of the URL.
- Review the playlist. If you created a looping playlist containing hinted MPEG-1 QuickTime files, QuickTime clients may have problems viewing the stream.

## If Users Can't Connect to Your Broadcast

Make sure the client computer has QuickTime 4 or later installed. If users are connecting using a web browser, make sure the QuickTime 4 Plug-in is installed correctly. Also consider the following:

- Make sure users have the correct URL.
- If users are attempting to connect to your broadcast over HTTP, make sure you disable any web server that may be conflicting with your streaming server. Also, make sure streaming on port 80 is enabled in the General Settings pane of QTSS Server Admin.

## If Users See Error Messages While Streaming Media

Here's what the messages mean:

- **Error code 401:** The user has tried to access a protected file. Users may need to upgrade to QuickTime 5 or later.
- **Error code 404:** The server cannot locate the URL the user entered. Make sure users enter the correct URL for the broadcast. Tell users they should not enter an RTSP URL into the web browser's location address. RTSP URLs are used only with the Open URL command of QuickTime Player.
- **Error code 415:** The movie file is not hinted or has a compressed movie resource. You need to hint the movie again using the Pro version of QuickTime Player. Alternatively, you may be attempting to natively serve MP3 files on demand (that is, as an HTTP download). QTSS support of MP3 streams is intended for Shoutcast/Icecast-compatible live streams (such as those created by an MP3 playlist) or live streams of other compatible MP3 live encoder broadcasters. If you want to serve individual MP3 files on demand (not as live streams), host the files on a web server.
- **Error code 453:** The server is too busy for users to view the stream. Users should try again later. You may want to increase the maximum number of connections in the General Settings pane of QTSS Server Admin.
- **Error code 454:** The connection to the server was dropped. Users must start viewing the stream again. Check if the server is behind a firewall or the client is behind Network Address Translation (NAT) software. See "Serving Streams Through Firewalls Using Port 80" on page 31 and "Streaming Through Firewalls or Networks with Address Translation" on page 31.



- **Error code –5420:** The server may not be running. Inspect the streaming server and restart it if necessary. See if the server is behind a firewall or the client is behind Network Address Translation (NAT) software. See “Serving Streams Through Firewalls Using Port 80” on page 31 and “Streaming Through Firewalls or Networks with Address Translation” on page 31.



This chapter explains QuickTime Broadcaster, Apple's award-winning live-encoding software for professional-quality live events.

QuickTime Broadcaster takes full advantage of QuickTime, the most powerful digital media technology on the Internet. The combination QuickTime Broadcaster, QuickTime Streaming Server (QTSS) and QuickTime provides the industry's first end-to-end MPEG-4-based Internet broadcasting system, which allows you to reach not only the large and growing base of QuickTime Players, but also any ISO-compliant MPEG-4 player.

QuickTime Broadcaster provides a basic view that includes presets for popular broadcasting configurations, making it easy to start broadcasting in a few clicks. Or you can customize your own settings in the expanded view and then save and share them with others.

## When to Use a Streaming Server

To send your broadcast over the Internet or to more than one viewer over a local network that is not multicast-enabled, you need a streaming server. The streaming server replicates the single stream from QuickTime Broadcaster and allows multiple QuickTime Players to connect to the broadcast.

You can use QuickTime Broadcaster without a streaming server to send your broadcast to a single viewer (with QuickTime Player), or to multiple viewers using the multicast method of transmission.

## Setting Up Your First Stream

You can set up your first stream and put it on the air in less than five minutes.

The following instructions are for setting up a direct one-to-one connection (not using QTSS or other streaming software) to a computer with QuickTime Player.

You need to know the IP address of the receiving computer.

- 1 Connect a camera or other video input device to your computer.
- 2 Open QuickTime Broadcaster and, if the expanded window is open, click Hide Details.
- 3 Choose options from the Audio and Video pop-up menus that best fit your situation.
- 4 Click Show Details, click Network, and choose Manual Unicast from the Transmission pop-up menu.
- 5 In the Address field, enter the IP address of the receiving computer.  
Leave other settings at their default values.
- 6 In QuickTime Broadcaster, choose File > Export SDP.  
The file saved in this step is the Session Description Protocol (SDP) file, which contains information your audience will need to watch your broadcast.
- 7 Send or copy the SDP file to the computer that will be used to view your broadcast.
- 8 On the sending computer, start the broadcast by clicking Broadcast in the QuickTime Broadcaster window.

To view the broadcast, double-click the SDP file on the receiving computer.

## Setting Up QuickTime Broadcaster

In this example, QuickTime Broadcaster is installed on a notebook computer. Plug a FireWire camera into the notebook, turn the camera on, and see if QuickTime Broadcaster recognizes it.

- 1 Open QuickTime Broadcaster and click Show Details.
- 2 Click Video and choose a video source from the Source pop-up menu.  
If the camera is recognized, it appears in the Source menu. Video settings should also be active (not dimmed).  
If the camera doesn't appear in the Source menu, quit QuickTime Broadcaster, make sure your camera is connected and turned on, and then open QuickTime Broadcaster again. If your camera still does not appear, check the QuickTime website or the AppleCare Service & Support website for information on compatibility and other issues.  
When broadcasting to QTSS on a separate computer, as in this example, Automatic Unicast (Announce) is the recommended transmission method. It's easy to set up.
- 3 In QuickTime Broadcaster, click Show Details, click Network, and choose Automatic Unicast (Announce) from the Transmission pop-up menu.
- 4 In the Network pane, enter the IP address or host name of the receiving computer, a name for the broadcast file, the user name and password for the broadcaster user, and the buffer delay (or accept the default).

**Note:** The buffer delay sets the number of seconds QuickTime buffers the broadcast before playback. For broadband connections, QuickTime Player 6 or later fills the buffer more quickly than real time, providing an Instant-On viewing experience.

- 5 Click Broadcast and start QTSS (if it's not already running) by selecting the computer in Server Admin, clicking QuickTime Streaming, and clicking Start Service.

To find out if the live stream can be seen from a client, open QuickTime Player on a client computer and Choose File > Open URL in New Player.

- 6 Enter the Real-Time Streaming Protocol (RTSP) URL displayed in the Location section of the QuickTime Broadcaster window (for example, `rtsp://myserver.com/mystream.sdp`).

**Note:** The URL is case-sensitive and must be entered as displayed in the QuickTime Broadcaster window.

The live stream should start playing in QuickTime Player.

- 7 Test the setup.

This should be done as realistically as possible. Be sure to test the following:

- Set up your equipment as it will be used for the live presentation—if possible, in the actual location.
- Ask a colleague to stand in for the presenter, or better yet, have the presenter take part in the test, making it a dress rehearsal.
- Verify the video image and the sound.
- Verify that clients on the local network and on the Internet can tune in to the live stream.
- Adjust the camera and microphone positions and lighting as necessary and troubleshoot any other problems.

## Choosing a Broadcast Method

The broadcast method you choose depends on the size of your expected audience:

- When broadcasting a live event to only one viewer, you can use QuickTime Broadcaster on Mac OS X; you don't need server software. Sending a broadcast to one recipient is called unicasting. Unicasting is the most common delivery method for general Internet broadcasting.

The unicast recipient must have a computer with QuickTime Player, QuickTime Streaming Server (QTSS), or Darwin Streaming Server installed. If the recipient has server software, the server can reflect your broadcast to multiple viewers.

- For an audience of a few hundred connected users, a single Mac computer can run both QuickTime Broadcaster and QTSS. QuickTime Broadcaster sends the stream to QTSS, which then delivers the stream to a group of clients.

The number of clients that can connect to the broadcast depends on available bandwidth and processor capacity. A typical Mac Pro configuration supports at least 200 DSL connections or 400 dial-up connections. This configuration works well for online classes, lectures, and other events with a limited audience.

- If your broadcast is to be viewed by a large number of people, use two computers, one with QuickTime Broadcaster to broadcast the stream, and the other with QTSS to reflect the stream to multiple viewers.
- If you are on a multicast-enabled network, you can reach multiple viewers by multicasting your broadcast. Multicasting is a method of broadcasting over a local network (not over the Internet) using a single stream that's shared among all viewers of the broadcast. Each viewer tunes in to the broadcast much like a radio tunes into an FM broadcast.

## Choosing Compression Settings

Quicktime Broadcaster offers a full range of audio and video codecs for real-time compression and streaming. This section helps you pick the codecs most appropriate for your situation.

In general, it's best to set audio options before video settings. In QuickTime Broadcaster you can choose from any of the compressors included with QuickTime. This allows you to select the best codec for the type of content being broadcast and for your viewers' connections.

For beginners, QuickTime Broadcaster includes default settings (presets) optimized for common types of content and audience connections. For example, the default setting for speech is MPEG-4 audio (AAC) at 8 kHz mono. Although MPEG-4 audio is generally considered a music codec, it also works well for speech content.

You can also create your own settings in the Audio pane of QuickTime Broadcaster. (If you don't see the Audio button, click Show Details.) The settings you create can be saved for future use and shared with others for use with their broadcasts.

For many types of broadcasts, choose the video settings after determining the audio compression. Video quality is usually less important than audio, because dropped or garbled audio is very hard to understand and will quickly frustrate your audience.

The video compression settings for a broadcast depend on the type of motion that will be broadcast and the bandwidth available to viewers. QuickTime Broadcaster provides default settings (presets) for common situations.

For example, video for clients on a local area network (LAN) uses the H.264 codec with a 480 x 360 frame size at 30 frames per second (fps), limiting the data rate to 1372 kilobits per second (Kbps). Video for clients with dial-up connections uses the H.264 codec with a 160 x 120 frame size at 6 fps, limiting the data rate to 30 Kbps.

## Creating Presets

After you select a compressor to use for audio or video, you can fine-tune your results by selecting additional options. For many audio compressors, you can adjust the sampling rate, or choose between mono and stereo sound. Many video compressors allow you to set frame rates and key frame settings.

**To determine whether you can customize codec settings:**

- In the Video pane of QuickTime Broadcaster, click the Options button next to the compressor's name.

If the button is dimmed, no additional settings are available.

## What an SDP File Is

A Session Description Protocol (SDP) file describes the parameters and settings for a broadcast, thereby enabling QuickTime Player to receive the broadcast. To view a broadcast, you open the SDP file with QuickTime Player.

You can create an SDP file for any of the three transport options:

- **Automatic Unicast (Announce):** The SDP file can be created automatically on a specified QuickTime Streaming Server. The location address appears only in this case.
- **Manual Unicast:** The SDP file is placed on a streaming server or opened directly in QuickTime Player.
- **Multicast:** The SDP file is opened by hand in QuickTime Player.

**To create an SDP file:**

- In QuickTime Broadcaster, choose File > Export > SDP.

You can send the SDP file to a single viewer or to a streaming server that allows many viewers to connect to the broadcast.

## Choosing Network Settings

A successful streaming broadcast requires coordination between codec settings and network settings. Choosing a high data rate codec for use on a slower connection will result in viewing problems.

Use this section to help you choose network settings for your broadcast and to serve as a starting point for adjusting parameters to meet your requirements.

## Using Automatic Unicast (Announce)

You can use QuickTime Broadcaster to broadcast to QTSS using the Automatic Unicast (Announce) transmission method. To do so, you need:

- A broadcaster user account. QuickTime Broadcaster will ask for the account's user name and password, to allow an SDP file to be created on the streaming server. If you're using QuickTime Broadcaster and QTSS on the same computer, you don't need a broadcaster user account.
- QTSS 4.0 or later installed on the streaming server.

### To start an Automatic Unicast broadcast:

- 1 In QuickTime Broadcaster, click Show Details (if the expanded window isn't open) and click Network.
- 2 Choose Automatic Unicast (Announce) from the Transmission pop-up menu.
- 3 Enter the IP address or host name of the receiving server, the name of the broadcast file, the user name and password for the streaming server user account (if needed), and the buffer delay (or accept the default).
- 4 Click Broadcast.

All information is sent to the server. You do not need to create an SDP file.

## Using Manual Unicast

Manual unicast is a method of broadcasting that requires you to export an SDP file from QuickTime Broadcaster to a receiving computer identified by its IP address. The receiving application can be a single QuickTime Player, QTSS, or Darwin Streaming Server (DSS). If the receiving application is QTSS or DSS, the broadcast is reflected and no longer limited to a single IP address.

### To broadcast via Manual Unicast:

- 1 In QuickTime Broadcaster, if the expanded window is not open, click Show Details.
- 2 Click Network.
- 3 Choose an option from the Preset pop-up menu.
- 4 Choose Manual Unicast from the Transmission pop-up menu.
- 5 Enter the IP address of the receiving computer.

To see the IP address of a Mac OS X computer, open System Preferences, click Network, and choose an option from the Show pop-up menu. On a Windows computer, open the Control Panel and then open Network Connections.

- 6 Enter the audio port and video port numbers (or accept the defaults if broadcasting one-to-one), and the buffer delay (or accept the default).
- 7 If you want, enter information in the Annotation section.



- 8 Click Broadcast.
- 9 Choose File > Export > SDP or File > Export > Movie.
- 10 Specify a name for the SDP or movie file and click Export.

If the file is exported to QuickTime Player, the user opens the file by choosing File > Open File.

If the file is exported to QTSS or DSS, the user chooses File > Open URL. Talk to your QTSS or DSS administrator to determine the correct URL.

## Using Multicast

Multicasting is a method of broadcasting over a local network (not over the Internet) using a single stream that's shared among all viewers of the broadcast. Each viewer tunes in to the broadcast much like a radio tunes in to an FM broadcast.

Multicasting requires a network that has access to a multicast backbone (MBone) or is multicast-enabled.

You can multicast over a local network if it is multicast-enabled. Contact your network administrator to find out if your network supports multicasting.

### **To broadcast over a local network using the multicast method:**

- 1 In QuickTime Broadcaster, if the expanded window isn't open, click Show Details.
- 2 Click Network.
- 3 Choose Multicast from the Transmission pop-up menu.
- 4 Click Generate IP Address.

This enters the IP address you're using to send the multicast. An address is created in a range reserved for multicast broadcasts. If your network administrator has assigned specific multicast addresses, you can enter an address manually.

- 5 Specify a Time To Live (TTL) setting (or accept the default).

This setting specifies the number of times a media stream can be passed from one router to another before the stream is no longer transmitted. The value can be any number between 1 and 255. A value of 1 reaches client computers on the local network. The larger the number, the farther the multicast packets will travel.

- 6 Choose File > Export > SPD or File > Export > Movie.

This creates a session description protocol (SDP) file or a QuickTime movie file, which you can send to others. To view the broadcast, double-click the SDP file or use QuickTime Player to open the movie file.

## Previewing Your Broadcast

You can preview your broadcast in the QuickTime Broadcaster window with or without compression. You can also turn off the preview function. Choose from the following:

- To preview your broadcast from the source, choose Source from the Preview pop-up menu (above the video preview area).
- To preview your broadcast with compression, choose Compress from the Preview pop-up menu and then choose from the presets listed in the Audio and Video pop-up menus. (If there are no pop-up menus below the preview area, click Hide Details.) Alternatively, click Show Details. In the Audio and Video panes, choose presets from the Preset pop-up menus or specify custom compression settings. In the Video pane, adjust the Quality slider for the best image.
- To turn the preview function off, choose None in the Preview pop-up menu.  
The preview shows you how your stream will appear under ideal circumstances. It doesn't take into account potential network delays or bandwidth limitations.

## Setting Up an Audio-Only Broadcast

You can use QuickTime Broadcaster to broadcast audio content such as a concert, speech, or meeting.

QuickTime Broadcaster works with:

- Audio supplied by your DV camera or other FireWire device
- An external (not internal) CD player
- A microphone or other analog audio source connected to the audio input ports of your computer, or to a USB audio input device such as the Griffin iMic

### To set up an audio broadcast:

- 1 In the QuickTime Broadcaster window, click Show Details (if the expanded window is not open) and click Audio.
- 2 Choose an audio source from the Source pop-up menu.  
If your audio source does not appear in the menu, quit QuickTime Broadcaster, make sure your equipment is connected and turned on, and try again.
- 3 Choose an appropriate compression setting from the Preset pop-up menu, or specify custom settings.
- 4 Click Video and make sure Enable Video Stream is deselected (this turns off the video stream).

If audio is creating feedback or you don't want to listen to it, you can turn it off by deselecting the "Play through speaker" checkbox in the Audio pane.

## Changing the Audio Source

QuickTime Broadcaster works with audio from a DV camera or Apple iSight camera, the audio input ports on your computer, and USB audio input devices such as the Griffin iMic.

### To choose an audio source:

- 1 In the QuickTime Broadcaster window, click Show Details (if the expanded window is not open) and click Audio.
- 2 Choose an audio source from the Source pop-up menu.

If an audio source is connected and providing input, you should hear audio through the computer (if “Play through speaker” in the Audio pane is selected), and audio settings should be available (not dimmed).

If your audio source does not appear in the Source pop-up menu, quit QuickTime Broadcaster, make sure your equipment is connected, and try again.

## Adding Annotations to Your Broadcast

You can add a title, copyright, and other annotations to your broadcast.

### To add annotations:

- 1 In QuickTime Broadcaster, click Network.  
If you can’t see the Network button, click Show Details.
- 2 Under Annotations, fill in the desired fields.

Your audience can view this information by choosing Window > Show Movie Info in QuickTime Player. (Viewers who don’t have QuickTime Pro see only the first three annotations.)

## Hinting the Movie File

You can save a compressed and hinted copy of your broadcast as a movie file. The movie is saved on the computer you broadcast from and is ready to post to a QuickTime streaming server so that viewers can watch a rerun of the event.

### To record your broadcast and hint a movie file:

- 1 Choose QuickTime Broadcaster > Preferences.
- 2 In the Recording field, specify a path (or click Choose to choose a location) in which to store your broadcast file.
- 3 Select “Hint for Streaming Server.”  
This option adds a hint track containing information needed to stream your movie.
- 4 Enter a name for your movie and click OK.

- 5 In the QuickTime Broadcaster window, select “Record to disk.”
- 6 Click Broadcast.

**Note:** An archived broadcast can use a great deal of disk space. If the broadcast is more than a few hours, more than one .mov file might be created. If so, the files are numbered sequentially (for example, “mymovie.mov,” “mymovie2.mov,” and so on).

## Saving Settings Using Presets

You can save your audio, video, and network settings so that you can use them again later.

### To create a preset:

- 1 In QuickTime Broadcaster, choose the settings in the Audio, Video, and Network panes. If you don’t see these panes, click Show Details.
- 2 Choose Save Preset from the Preset pop-up menu.
- 3 To reuse these settings, choose your preset from the Preset pop-up menu in each pane (Audio, Video, or Network).
- 4 To transfer your presets to another computer, choose QuickTime Broadcaster > Preferences and enter a path in the Presets Directory field (or click Choose and select a destination).

**Note:** Presets must be located in ~/Library/QuickTime Broadcaster. Others using your presets must place their files in the same location on their computers.

## Changing the Size of the Broadcast Image

You can change the size of the image viewed by your audience. Large frame sizes are often desirable but require more bandwidth and can place excessive demands on slower computers (both broadcasting and receiving). If sound is more important than video in your broadcast (such as a broadcast of a concert or lecture), consider reducing the frame size to allow more bandwidth to be allocated to the audio.

### To change the size of the video frame your audience receives:

- 1 In the QuickTime Broadcaster window, click Show Details (if the expanded window is not open) and click Video.
- 2 In the Compression area, enter new numbers into the Width and Height fields.

This procedure does not affect the size of the Preview image in QuickTime Broadcaster.

## Changing the Video Source

QuickTime Broadcaster works with DV cameras, Apple iSight cameras, IIDC cameras (supported only in Mac OS X v10.2 and later), and other DV sources (such as analog-to-DV converter boxes) that you can connect to your computer using FireWire.

### To choose the video source:

- 1 In the QuickTime Broadcaster window, click Show Details (if the expanded window is not open) and click Video.
- 2 Choose an option from the Source pop-up menu.

If a video source is connected and providing input, it should appear in the Source menu, and a preview image should display (if the preview function is on). Video settings should also be available (not dimmed).

If your input device does not appear in the Source menu, quit QuickTime Broadcaster, make sure your input device is connected and turned on, and open QuickTime Broadcaster again. If your input device still does not appear, it may not be compatible with QuickTime Broadcaster.

## Choosing the Packetizer

In most cases, the default packetizer settings for each compressor don't need to be changed. If you know RTP and want to fine-tune the packetizer, you can change the settings by clicking the Packetizer button in the Audio and Video panes and entering values in the dialogs that appear:

- If broadcasting AAC to mobile phones, change the packetizer to MPEG-4 LATM Audio.
- If broadcasting H.263 to mobile phones, change the video packetizer to H.263 3GPP.

## Saving Broadcast Settings

With QuickTime Broadcaster, you can create your custom broadcast settings and save them as documents for reuse and sharing with others.

### To save a custom broadcast setting:

- 1 Choose your audio, video, and network settings.
- 2 Choose File > Save Broadcast Settings As.
- 3 Specify a filename and location.

The file you save will have the extension .qtbr.

After the file is saved, double-clicking its icon opens QuickTime Broadcaster (if installed) with the custom settings in place. You can then click Broadcast to begin streaming.

## Broadcasting to Mobile Phones

QuickTime Broadcaster includes support for broadcasting to streaming-enabled mobile phones. It also includes presets for typical settings used when broadcasting to mobile phones.

To create custom settings for streaming to phones, contact the phone manufacturer to determine the supported audio and video codec. Typically, multimedia-enabled phones support MPEG-4 video and H.263 video, and AAC, AMR, or QCELP audio.

## About Firewalls

Network firewalls, which protect internal networks from outsiders, can interfere with your ability to send and receive broadcasts.

If you're broadcasting, contact your network administrator to ensure that outgoing ports are open for your broadcast. Many ISPs and corporate networks block these ports to limit bandwidth use and tighten security.

When sending a broadcast, QuickTime Broadcaster uses the following ports by default:

- Automatic Unicast (Announce): 554.
- Manual Unicast: Enter the port information in the Network pane.

To change a port number, add a colon and the port number to the end of the IP address. For example, 127.0.0.1:7070.

Audiences behind a firewall may be able to view your broadcast by adjusting the network settings in QuickTime preferences, or by configuring the use of a proxy server in Network preferences.

## Limiting Access to Your Broadcast

To limit who can see your broadcast, you can embed the broadcast movie in a webpage and control access to the HTML page using your web server's security settings.

If you distribute the SDP file or broadcast announcement movie, anyone who obtains the file can view the stream, unless you are broadcasting from within a firewall. If the broadcast is manual unicast, only the computer with the specified IP address can connect.

## Tips and Troubleshooting

The tips that follow will help you get the most from QuickTime Broadcaster.

### I am Being Asked for a Password

When you broadcast to QTSS or DSS using Automatic Unicast (Announce), you must provide a user name and password so that a user account and a broadcast file can be created on the streaming server computer. For details on how to create the special user account, see QTSS or DSS Help.

The user name and password required for automatic unicast are not the same as those used for the streaming server web admin utility.

### Getting the Most from Available Bandwidth

When configuring your broadcast consider the following:

- The upload speed when broadcasting. Most Internet service providers limit upload speed to between 128 kilobits per second and 256 kbps. That means that the total data rate for your broadcast (audio and video) should not exceed your upload speed. In fact, you should set it considerably lower than your upload speed to account for network congestion.
- The speed of your viewers' network connections. For example, if viewers connect with 56K modems, you should probably limit the overall data rate of your broadcast to 33 kbps. Viewers with faster connections can sustain higher rates, but even for those with T1 Internet access, you should probably limit your broadcast's data rate to 410 kbps. (Both of these numbers are conservative estimates.)
- How the broadcasting or streaming server computer is connected to the network and the expected number of viewers. If your streaming server computer is on a T1 line, a maximum of about 25 viewers can connect to your broadcast using 56K dial-up modems.

### Tips for Choosing Video Compression Settings

For many types of broadcasts, it's best to choose the video settings after determining the audio compression. Video quality is usually less important than audio, since dropped or garbled audio is very hard to understand and will quickly frustrate your audience.

The video compression settings for a broadcast depend a lot on the type of motion that will be broadcast and the bandwidth available to your viewers. QuickTime Broadcaster provides default settings (presets) for common situations.

For example, video for clients on a local area network (LAN) uses the H.264 codec with a 480 x 360 frame size at 30 frames per second (fps), limiting the data rate to 1372 kilobits per second. Video for clients with dial-up connections uses the H.264 codec with a 160 x 120 frame size at 6 fps, limiting the data rate to 30 Kbps.

## Tips for Choosing Audio Compression Settings

In general, it's best to set audio options before video settings. In QuickTime Broadcaster you can choose from any of the codecs included with QuickTime. This allows you to select the best codec for the type of content being broadcast and your viewers' connections.

For beginners, QuickTime Broadcaster includes default settings (presets) optimized for common types of content and audience connections. For example, the default setting for speech is MPEG-4 audio (AAC) at 8 kHz mono. (Although MPEG-4 audio is generally considered a music codec, it also works great for speech content.)

For audio that includes the music, the default setting is MPEG-4 audio (AAC) at 20 kilobits per second (Kbps) for dial-up users and 128 Kbps for LAN users.

## If the Video Looks Blurry, Stutters, or Freezes

If your broadcast looks blurry, stutters, or freezes, it could be the result of an out-of-focus camera, network congestion, or inappropriate compression settings.

To improve broadcast quality, try one or more of the following:

- Focus the camera.
- Reduce the number of simultaneous viewers (using the QTSS pane of Server Admin).
- If a recipient experiences stuttering during playback, adjust the broadcast data rate.
- Make sure you are broadcasting using a video codec optimized for streaming, such as H.264 or MPEG-4.
- Reduce the frame rate and the frame size of the video.

The best way to get a high-quality broadcast is to test various settings prior to delivering it. That way you can determine the optimal combination of settings for your particular content and your users' connection speeds.

## Automating QuickTime Broadcaster with AppleScript

You can use AppleScript to control QuickTime Broadcaster. For example, you can use a script to select which presets to use, to determine the status of a broadcast, and to start, stop, or pause a stream.

For detailed information on the AppleScript features QuickTime Broadcaster supports, drag the QuickTime Broadcaster icon to the Script Editor icon in /Applications/AppleScript/.



This chapter describes key components of a generic webcasting setup and how they are connected.

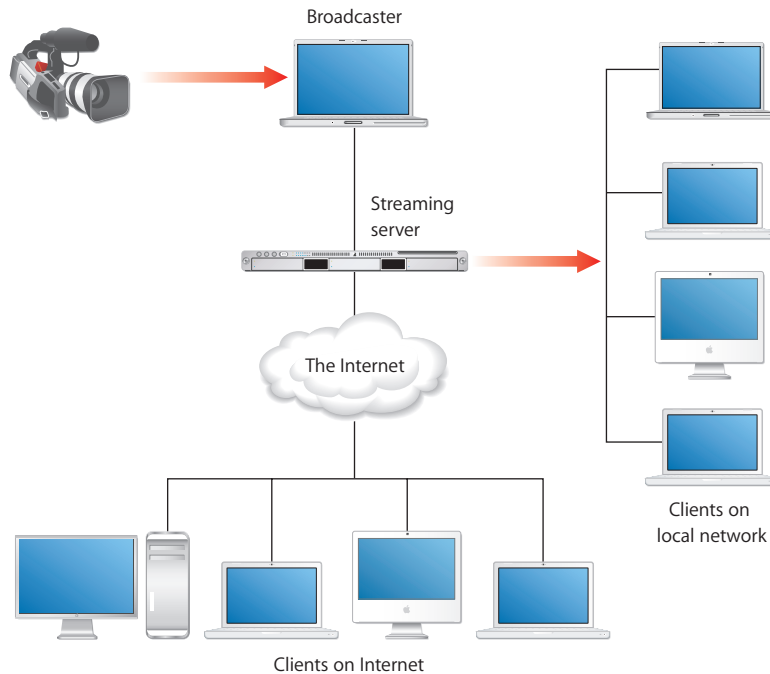
The setup instructions that follow assume an educational setting such as a university campus, but the example can be easily adapted for many uses:

- Distance learning classes
- Corporate communications to employees, customers, suppliers, or shareholders
- One-time concert or presentation
- Childcare center broadcasts to parents

## Streaming Presentations—Live and On Demand

The example shown in the following illustration shows how a university network administrator might set up a streaming server and other needed components to stream live and on-demand classroom presentations to students using client computers connected to the campus network and to the Internet.

This setup enables students who can't attend a class in person to view it online. It also enables students to review parts of the lecture later by playing an archived version on their computers.



The streaming setup in the example shown above has these features:

- An already-existing local network, with Ethernet connections to classrooms and lecture halls from which live presentations are to be streamed.
- A DV camera and microphone set up in a classroom or lecture hall to convert the live presentation to digital form. The camera makes a high-quality DV recording of the presentation and provides the digital signal to be encoded for live streaming.
- The DV camera connected through a FireWire port to a notebook computer running QuickTime Broadcaster, which encodes the digitized live presentation and transmits the signal via an Ethernet connection to the streaming server on the campus network.
- A streaming server, such as a rack-mounted Xserve running without a monitor and keyboard. The server is running Mac OS X Server with QTSS configured to reflect the encoded live presentation as a unicast stream to each client computer—on the campus network or on the Internet—that tunes in to the broadcast. The Xserve comes with Mac OS X Server and QTSS preinstalled.

- Client computers of various types with QuickTime Player or other MPEG-4 compliant software installed to access the Xserve streaming server via the campus network. Other client computers can access the streaming server via the Internet.
- The broadcaster notebook computer running iMovie is used to produce high-quality on-demand versions of a live presentation after the presentation is concluded. The recorded digitized presentation is brought into the computer for compression through its FireWire connection using the DV camera.

**Note:** QuickTime Broadcaster can be set to record the encoded live stream to disk for archival purposes. However, for best results, however, the footage should be encoded separately.

- The broadcaster notebook computer is also used to control the Xserve remotely using the Server Admin application (or using Web Admin, the QTSS web-based administration application).

**Note:** The notebook could also be connected to the local network wirelessly via an AirPort base station for extra portability. AirPort is 802.11 compliant and works well with QTSS. Its bandwidth is more than enough for our example setup if other clients don't place heavy demands on the same base station.

## Setting It Up

The following steps show how to set up QTSS and the other components needed for live and on-demand streaming in this hypothetical university setting.

### Step 1: Prepare the Location

A typical classroom doesn't provide a broadcasting and recording environment comparable to a professional television or recording studio. However, use the following measures to provide good results:

- Go into the classroom you want to use for live streaming, close the doors, and listen for extraneous noise that could interfere with a broadcast. If noise from a nearby break room, video gaming area, street traffic, or other source is noticeable and can't be eliminated, find another room.
- If extraneous noise is not an issue, stand in the center of the room, clap your hands or shout, and listen for an echo. If you hear an echo, the sound quality of a live broadcast can be compromised. You can reduce or eliminate echoes by hanging heavy curtains on bare walls or placing acoustic panels in a checkerboard pattern on each wall.
- Examine the floors and furniture. Carpeted floors and padded chairs are best. A lectern should have a cloth on top or other padded surface on top to protect from noises such as the speaker setting down a glass of water.

- Consider lighting problems. For more control, you should be able to draw the blinds and supplement room lights with a portable lighting kit that can be quickly set up for a live session.

## Step 2: Prepare the Network

Make sure there is an Ethernet connection to the room where the live broadcast is to take place. Install, repair, or replace cables and connectors as needed, using high-quality materials.

Keep in mind that streaming—especially live streaming—can make heavy demands on network resources, especially available bandwidth. To ensure that the network can handle the extra load, consider some or all of the following:

- Determine the capacity of the existing network and calculate the anticipated additional traffic generated by live and on-demand streaming.
- Draw a map of bandwidth segments on your network, listing the capacity between all points.
- Determine which applications are used in your network, their use patterns, where they are hosted, and the bandwidth they normally use during peak and off-peak times.
- Based on the configuration and capacities of your network, select the appropriate place to install your streaming server, avoiding potential bottlenecks.
- If necessary, add capacity to the network (additional T1 lines, routers, switches, and so on) to handle the anticipated maximum concurrent viewers of live broadcasts in addition to other peak network traffic.

**Note:** A typical local network provides bandwidth internally of 10–100 Mbps. In contrast, a T1 line provides only about 1.5 Mbps of bandwidth.

T1 lines work fine for HTTP and FTP, where requests are short-lived or are not time-sensitive, but streaming is much more demanding. With streaming you can't slow things down—the data must be transferred at least as fast as the original content data rate to deliver streams.

For this example, assume a maximum of 10 concurrent viewers, half on the local network and half on the Internet, and a bit rate for each unicast stream of approximately 256 kilobits per second. The peak extra bandwidth needed is then about 3.2–3.3 megabits per second (Mbps).

This estimate includes an extra margin of 25–30 percent for unplanned network congestion and peaks in the transmitted streams that can occur for various reasons.

### Step 3: Set Up Your Streaming Server

You must set up an administrator computer before you can configure and manage your streaming server if, as in this example, the streaming server is running headless, that is, without a display. For information on setting up an administrator computer, see *Mac OS X Server Getting Started for Version 10.5 or Later* (included on a Mac OS X Server installation disc).

To set up and manage QTSS, you use the Server Admin application, which is installed with Mac OS X Server. After configuring Mac OS X Server, you can also use the web-based administration application, Web Admin, to manage QTSS remotely from any computer connected directly to the local network or to the Internet. For this example, the broadcaster notebook computer in the streaming setup illustration is also used for this purpose.

Although the Xserve comes with Mac OS X Server and QTSS preinstalled, the software must be configured for the particular network to which it is being added and for the specific uses to which it is to be put. For information on setting up Mac OS X Server, see the getting started guide.

Among the questions to be answered when setting up your streaming server are the following:

- Can the server computer be dedicated to streaming?  
It's best if your streaming server doesn't also handle web serving, mail serving, and other server tasks. This example is for a dedicated streaming server.
- How much random access memory (RAM) is needed?  
The minimum required to run QTSS is 128 megabytes (MB). Estimate about 256 MB of RAM for every 50 MB of throughput you plan to serve. This setup assumes 256 MB of RAM.
- How much hard disk storage is needed?  
Video files can be large. A hinted one-hour presentation encoded at 300 Kbps (not optimized for a server) takes up approximately 135 MB of hard disk space. A 60 GB hard disk can store more than 400 such presentations.

Here's a formula for calculating streaming file sizes:

```
dataRateInBits / 8 bits * timeInSeconds = file size
```

Example for a one-hour 300-Kbps stream:

```
300,000 / 8 bits * 3600 = 135,000,000 bytes = 135 MB file size
```

Many local networks include redundant arrays of independent disks (RAID) storage systems, which provide much larger amounts of hard disk space.

If you store streaming files anywhere other than in the QTSS default location (/Library/QuickTimeStreaming/Movies), you must enter the path in the Settings pane of QuickTime Streaming in Server Admin. See “Changing the Streaming Media Directory” on page 27. Place any Session Description Protocol (SDP) files referencing live webcasts in the same location so they can be recognized by QTSS.

In this example, all archived streaming files and SDP reference files reside in the default Movies folder on the streaming server.

- Does the streaming server have an adequate network card?  
The network card is a critical component of your streaming server, since it provides Ethernet connectivity between the server and your audience. An Ethernet card should provide a minimum of 100 megabytes (about 0.1 gigabit) per second of throughput.
- Where will the streaming server be located on the network? What about a firewall?  
The streaming server must be located where it will be accessible to users (in our example, students) logging in from both the local network and the Internet. It also should be protected by a firewall from unauthorized access to the server and to archived media files.

Mac OS X Server includes IP Firewall service, which scans incoming IP packets and rejects or accepts these packets based on a set of filters you create. For instructions on setting up this service, see the network services administration guide.

Specific ports must be opened in the firewall to allow Real-Time Streaming Protocol (RTSP) requests from users, encoded video and audio from the broadcaster, and outbound streams to clients on the local network and the Internet. The table below lists the ports used by QTSS and for incoming and outgoing requests. (For more information about enabling QuickTime Streaming over a firewall, see “Security and Access” on page 30.)

Usage	Ports	Protocols	Notes
Responding to messages from clients (such as Play and Pause)	TCP (client initiates -> QTSS) 554, 7070, 8000, 8001, 80	RTSP, RTP, RTCP, MP3	Main port is 554. 80 is supported in the QT client as an alternative TCP port. These ports also send data to clients.
Sending media and receiving client status	• UDP data (QTSS -> client): 6970–6999, even numbers	RTP	Status is required to maintain a connection; if blocked, the server disconnects the client.
	• UDP status (QTSS <-> client): 6971–6999, odd numbers	RTCP	
	• TCP data & status (QTSS <-> client): 554, 7070, 8000, 8001, 80	RTSP, RTP, RTCP	Same ports used to respond to messages.

Usage	Ports	Protocols	Notes
Receiving broadcasts	<ul style="list-style-type: none"> <li>• UDP data (broadcaster -&gt; QTSS): 6972–65535, even numbers</li> <li>• UDP RTCP status (broadcaster &lt;-&gt; QTSS): 6973–65535, odd numbers</li> <li>• TCP (broadcaster initiates -&gt; QTSS): 554, 7070, 8000, 8001, 80</li> </ul>	RTP  RTCP  RTSP, RTP, RTCP	Ports depend on the broadcaster configuration.  Status is required to maintain a connection; if blocked, the server disconnects the broadcaster.  Broadcasters can broadcast over their TCP message connection with the server instead of using UDP ports.
Streaming through server	TCP (client initiates -> QTSS): 554, 7070, 8000, 8001, 80	RTSP, RTP, RTCP, MP3	Same ports used to respond to messages and receive TCP broadcasts.
MP3 broadcasts (typical default)	TCP (client -> QTSS): 8000		
Managing QTSS remotely with Server Admin	TCP (admin client initiates -> server): 311		
Managing QTSS remotely with Web Admin	TCP (web browser client initiates -> server): 1220		

In this setup example, assume that the students connecting to the streaming server via the Internet are *not* behind their own firewalls. In that case, it isn't possible to enable streaming on port 80, the port typically carrying HTTP Internet traffic and allowed by most firewalls.

If some clients *are* behind firewalls, consider enabling streaming on port 80 for those clients to access the streams. For instructions, see “Serving Streams Through Firewalls Using Port 80” on page 31.

### Will it be necessary to set up a broadcaster user account on the streaming server?

In this setup example, you must to create a broadcaster user name and password because the encoding software and QTSS are on separate computers. Creating a broadcaster user allows an SDP file, which provides information about the format, timing, and authorship of a live streaming broadcast, to be created on the server. After you specify a name and password, you enter in QuickTime Broadcaster.

For instructions on creating or changing a broadcaster user name and password, see “Using Automatic Unicast (Announce) with QTSS on a Separate Computer” on page 32. You'll need to use the administrator computer previously set up.

### Will users require authentication to access live or archived presentations?

In our example setup, no authentication is necessary. However, if you want to restrict access to your streams, you must set up individual or group streaming user names and passwords. For information on how to set up and manage such accounts, see the appropriate topics under “Security and Access” on page 30.

#### Step 4: Set Up for a Live Webcast

For the example setup, the following items are needed:

- Good-quality DV camera
- Microphone placed near the speaker, either on a stand or clipped to the speaker's clothing, connected by good-quality audio cable to the DV camera audio input
- Sturdy tripod on which to mount the camera
- Portable lighting kit

#### The Camera Is the First Link

Because the camera is the first link in the video signal chain, it is very important. Two main components determine a DV camera's picture quality:

- **Lens quality.** The better the lens, the better the image.
- **Image capture mechanism.** DV cameras use charge-coupled devices (CCDs) to convert the picture into electronic signals. The number and size of the CCDs affect the quality of the image.

Optical zoom gives better quality than digital zoom, but you should avoid zooming when streaming a live presentation to avoid degrading the stream.

Lower-end DV cameras use a single CCD to capture the complete image, whereas higher-quality cameras use three separate CCDs to scan the red, blue, and green content of the image, giving a better quality scan. CCDs range in size from 1/4 inch to 2/3 inch; bigger CCDs give better resolution.

Here are other desirable features:

- You should be able to override automatic camera settings.
- You'll want to use a separate microphone that can plug in to the camera for optimal sound pickup. A built-in microphone is unsuitable for most situations.
- The camera should accept professional XLR plugs (as opposed to the 1/8-inch mini-ack connectors). It should also have a headphone jack for monitoring the audio input.
- FireWire output enables digital transfers and automated capture, which can save time later.



### Keep the Microphone Close

The microphone is the first link in the audio signal chain and so is also very important. Dynamic microphones are a good all-around choice and can be purchased for as little as \$100.

The best way to improve audio if the room has bad acoustics is to place the microphone as close as possible to the person doing the speaking. Use a small lavalier (lapel) microphone clipped to the front of the speaker's clothing immediately under the mouth, or use a handheld microphone.

In the case of a panel discussion, use multiple microphones, preferably on sturdy stands, and a small audio mixer. Connect the mixed stereo output from the mixer into the line input on the DV camera.

If using an external microphone or mixer, make sure all connectors are securely plugged in to assure reliable audio. Plug a pair of headphones into the video camera's headphone output to make sure you can hear the audio and that it's not distorted.

### A Tripod Is a Must

It's important to use a camera tripod when shooting a live presentation, and also to avoid pans, tilts, and zooms. If the camera moves just one degree, every pixel in the frame changes, multiplying the difficulty of encoding the stream adequately. What was a simple scene to encode suddenly becomes much more difficult.

The tripod should be lightweight while still providing stable support for the camera's weight.

### Get a Simple Lighting Kit

Lighting is a big subject and beyond the scope of this guide, but here are some brief suggestions.

Even a high-quality video camera will produce poor results without proper lighting. It's unlikely that the normal lighting available in a typical classroom will be adequate for shooting a live presentation. At a minimum, you'll probably want to add backlighting to make your subject stand out from the background. A portable lighting kit supporting three-point lighting, plus a reflector or two if you're planning to shoot outside, can greatly improve your results.

### Step 5: Set Up Broadcaster for Automatic Unicast (Announce)

When broadcasting to QTSS on a separate computer, as in this example, Automatic Unicast (Announce) is the recommended transmission method. It's easy to set up.

In this example, QuickTime Broadcaster is installed on a notebook computer. This encoding software is included on the Mac OS X Server CD and can also be downloaded free of charge from the QuickTime Broadcaster website at [www.apple.com/quicktime/broadcaster](http://www.apple.com/quicktime/broadcaster)

Once the encoder software is installed, plug the camera into the notebook using FireWire, turn the camera on, and see if QuickTime Broadcaster recognizes it.

- 1 Open QuickTime Broadcaster and click Show Details.

- 2 Click Video and choose a video source from the Source pop-up menu.

If the camera is recognized, it appears in the Source menu. Video settings should also be active (not dimmed).

If the camera doesn't appear in the Source menu, quit QuickTime Broadcaster, make sure your camera is connected and turned on, and then open QuickTime Broadcaster again. If your camera still does not appear, check the QuickTime website or the AppleCare Service & Support website for information on compatibility and other issues.

- 3 In QuickTime Broadcaster, click Show Details, click Network, and choose Automatic Unicast (Announce) from the Transmission pop-up menu.
- 4 In the Network pane, enter the IP address or host name of the receiving server (the Xserve in this example), a name for the broadcast file, the user name and password for the broadcaster user created in Step 3, and the buffer delay (or accept the default).

**Note:** The buffer delay sets the number of seconds QuickTime buffers the broadcast before playback. For broadband connections, QuickTime Player 6 or later fills the buffer more quickly than real time, providing an "Instant-On" viewing experience.

- 5 Click Broadcast and start QTSS (if it's not already running) by selecting the computer in Server Admin, clicking QuickTime Streaming, and clicking Start Service.

To find out if the live stream can be seen from a client, open QuickTime Player on one of the client computers and do the following:

- 6 Choose File > Open URL in New Player.
- 7 Enter the Real-Time Streaming Protocol (RTSP) URL displayed in the Location section of the QuickTime Broadcaster window (for example, `rtsp://myserver.com/mystream.sdp`).

**Note:** The URL is case-sensitive and must be entered exactly as displayed in the QuickTime Broadcaster window.

The live stream should start playing in QuickTime Player.

### Step 6: Test Your Setup

The last step is to test the setup. This should be done as realistically as possible.

- Set up your equipment just as it will be used for the live presentation—in the actual location, if possible.
- Ask a colleague to stand in for the presenter, or better yet, have the presenter take part in the test, making it a “dress rehearsal.”
- Check the video image and the sound.
- Check that clients both on the local network and on the Internet can tune in to the live stream.
- Adjust the camera and microphone positions and lighting as necessary and troubleshoot any other problems.

## Creating a Webpage for Easy Access

Enabling access from a webpage eliminates students’ having to remember the RTSP URL and names of the streaming server and SDP files.

In our example, the webpage can be added to the existing university website, but it can reside on any web server. Students can access the live presentation (as well as the archives) by clicking links in their browser.

To create a link to the live stream on a webpage, you must embed a streaming movie. One way to embed a streaming movie is with a reference movie.

There are a variety of ways to create reference movies, which function like pointers to the actual media. The simplest way to create a reference movie is with QuickTime Pro:

- 1 Open QuickTime Player Pro.
- 2 From the File menu select “Open URL...”
- 3 Open the URL to your streaming movie using the rtsp URL.
- 4 Save the movie that plays as a Self-Contained movie.
- 5 Put the movie that you saved on your website.
- 6 Make the reference movie the first attribute you specify in the QT WriteObject method call.

If you don’t have QuickTime Pro, you can create a simple reference movie with any text editor. Just create a text file with one line in the following format:

```
RTSPtextRTSP://<your server>/<your streaming movie>
```

Save the file with the .mov extension and place the file on your web server. To embed the movie on a webpage, use the Object/Embed tag in the webpage's HTML. For example, if the reference movie was named "live.mov" and is in the same directory as the HTML page, the following tag would embed the live stream:

```
<OBJECT CLASSID="clsid:02BF25D5-8C17-4B23-BC80-D3488ABDDC6B" WIDTH="320"
      HEIGHT="256" CODEBASE="http://www.apple.com/qtactivex/qtplugin.cab">
<PARAM NAME="src" VALUE="live.mov">
<PARAM NAME="autoplay" VALUE="true">
<EMBED SRC="live.mov" WIDTH="320" HEIGHT="256" PLUGINSOURCE="http://
      www.apple.com/quicktime/" AUTOPLAY="true" />
</EMBED>
</OBJECT>
```

There are many resources with information about authoring webpages with QuickTime content. Some excellent references include:

*Quicktime for the Web*, by Steven Gulie, is the definitive book on QuickTime web authoring with QuickTime Pro keys included.

Apple's website documents the attributes of the Object/Embed tag:  
[www.apple.com/quicktime/authoring/embed.html](http://www.apple.com/quicktime/authoring/embed.html)

## Shooting the Live Presentation

If all the preparatory work has been done as outlined above, and the equipment and connections have been thoroughly tested, shooting the live presentation should be straightforward.

Here are a few tips for avoiding problems during the event:

- On the day of the actual event to be streamed live, set up early so you have time to check once again that all components are working as expected.
- If an audience is to be present, let them know in advance that you will be webcasting the presentation live and ask for their cooperation.
- Tape down any cables along the floor to minimize tripping hazards.
- Use a directional microphone or a live audio feed if at all possible.
- Check for potential sources of extraneous noise and take abatement measures if possible.

## Archiving the Live Presentation

In the example setup, the iMovie application, which comes with Mac OS X, is on the notebook. iMovie is used to import the recorded DV footage from the camera tape and then to encode and archive taped live presentations.

**To archive a live presentation, first import the recorded DV footage:**

- 1 Connect the DV camera to the notebook using FireWire and turn on the camera.
- 2 Insert the tape with the video footage to be archived and switch to VTR mode.
- 3 On the notebook, open iMovie and set the Mode Switch under the iMovie monitor to Camera mode (drag the round blue slider toward the DV camera icon).
- 4 Use the playback controls to view a portion of the tape in the iMovie monitor. If the tape doesn't play, check the connections and make sure the camera is turned on.
- 5 Rewind the tape to a few seconds before the point where you want to start importing.
- 6 Click Play below the iMovie monitor.
- 7 Click Import when you see the point in the presentation where you want to start importing.
- 8 Click Import again when you want to stop importing.
- 9 If you get some footage that you don't want to include in your archived presentation, you can edit it later using iMovie.

**Important:** You'll need to monitor hard disk space as you import video and create your iMovie. One minute of DV footage uses about 220 MB of hard disk space, so a one-hour presentation can use up more than 13 gigabytes of disk space. The Free Space status bar, below the clip shelf, shows how much disk space is available at any point in the import process.

**Next, use iMovie to compress and encode the DV footage for streaming:**

- 1 In iMovie, choose File > Export Movie.
- 2 Choose To QuickTime from the Export Movie pop-up menu.
- 3 Choose a movie format from the Formats pop-up menu.

You can choose one of the QuickTime formats optimized for different uses or choose Expert, which provides custom QuickTime settings such as MPEG-4 Video.

- 4 Click Export.
- 5 Name your movie, select a destination for the file, and click Save.

The time it takes to save the movie depends on the movie's length and the format you chose.

**Note:** You may want to save more than one archive streaming file, each compressed for a different connection speed. For example, you might choose lower compression settings for clients on the campus network and higher compression settings for clients connecting over the Internet.

- 6 After you have saved the encoded file or files, check to make sure every file streams properly.



**access file** A text file called qtaccess that contains information about users and groups who are authorized to view media in the directory in which the access file is stored.

**administrator** A user with server or directory domain administration privileges. Administrators are always members of the predefined “admin” group.

**administrator computer** A Mac OS X computer onto which you’ve installed the server administration applications from the Mac OS X Server Admin CD.

**announced broadcast** A method such as Automatic Unicast (Announce) that enables a broadcaster to negotiate with a server to accept a broadcast.

**AppleScript** A scripting language with English-like syntax, used to write script files that can control your computer. AppleScript is part of the Mac operating system and is included on every Macintosh.

**Automatic Unicast (Announce)** A method of delivering a broadcast to a streaming server in which an SDP file is automatically copied and kept current on the server. A broadcast user name and password must be created before starting such a broadcast.

**AVI** Audio Visual Interleave. A Windows video file format.

**bandwidth** The capacity of a network connection, measured in bits or bytes per second, for carrying data.

**bit** A single piece of information, with a value of either 0 or 1.

**bit rate** The speed at which bits are transmitted over a network, usually expressed in bits per second.

**broadcast** In a general networking context, the transmission of a message or data that any client on the network can read. Broadcast can be contrasted with unicast (sending a message to a specific computer) and multicast (sending a message to a select subset of computers). In QuickTime Streaming Server, the process of transmitting one copy of a stream over the whole network.

**broadcast user** A user who has permission to broadcast to the streaming server. The broadcast user name and password are set in the General Settings pane of Streaming Server Admin and are used in conjunction with announced broadcasts. It isn't necessary to create a broadcast user for UDP broadcasts.

**browser plug-in** Software that you attach to a browser to enable it to display specific data formats.

**byte** A basic unit of measure for data, equal to eight bits (or binary digits).

**client** A computer (or a user of the computer) that requests data or services from another computer, or server.

**codec** Any technology for compressing and decompressing data. Codecs can be implemented in software, hardware, or a combination of both.

**data rate** The amount of information transmitted per second.

**DNS** Domain Name System. A distributed database that maps IP addresses to domain names. A DNS server, also known as a name server, keeps a list of names and the IP addresses associated with each name.

**DSL** Digital subscriber line. A broadband data transmission technology that operates over telephone lines.

**DV** Digital video. A digital tape-recording format using approximately 5:1 compression to produce Betacam quality on a very small cassette.

**firewall** Software that protects the network applications running on your server. IP firewall service, which is part of Mac OS X Server software, scans incoming IP packets and rejects or accepts these packets based on a set of filters you create.

**FireWire** A hardware technology for exchanging data with peripheral devices, defined by IEEE Standard 1394.

**frame** In QuickTime streaming, a single image in a movie or sequence of images.

**frame rate** In a movie, the number of frames per second.

**FTP** File Transfer Protocol. A protocol that allows computers to transfer files over a network. FTP clients using any operating system that supports FTP can connect to a file server and download files, depending on their access privileges. Most Internet browsers and a number of freeware applications can be used to access an FTP server.



**hinting** A process that creates a track for each streamable media track in the file that tells QuickTime Streaming Server how and when to deliver each frame of media. The hinting process performs the required calculations in advance, allowing QTSS to serve up a larger number of streams. Hinting also allows new codecs to be used without the need to upgrade the server.

**HTML** Hypertext Markup Language. The set of symbols or codes inserted in a file to be displayed on a World Wide Web browser page. The markup tells the web browser how to display a webpage's words and images for the user.

**HTTP** Hypertext Transfer Protocol. The client/server protocol for the World Wide Web. The HTTP protocol provides a way for a web browser to access a web server and request hypermedia documents created using HTML.

**IEEE** Institute of Electrical and Electronics Engineers, Inc. An organization dedicated to promoting standards in computing and electrical engineering.

**Instant On** In QuickTime streaming, an advance in Apple's patent-pending Skip Protection technology that dramatically reduces buffer, or wait, time for an instantaneous viewing experience with streaming video on a broadband connection.

**IP** Internet Protocol. Also known as IPv4. A method used with Transmission Control Protocol (TCP) to send data between computers over a local network or the Internet. IP delivers packets of data, while TCP keeps track of data packets.

**IP address** A unique numeric address that identifies a computer on the Internet.

**IP subnet** A portion of an IP network, which may be a physically independent network segment, that shares a network address with other portions of the network and is identified by a subnet number.

**ISP** Internet service provider. A business that sells Internet access and often provides web hosting for ecommerce applications as well as mail services.

**JavaScript** A scripting language used to add interactivity to webpages.

**key frame** A sample in a sequence of temporally compressed samples that doesn't rely on other samples in the sequence for any of its information. Key frames are placed into temporally compressed sequences at a frequency that's determined by the key frame rate.

**key frame rate** The frequency with which key frames are placed into temporally compressed data sequences.

**LAN** Local area network. A network maintained within a facility, as opposed to a WAN (wide area network) that links geographically separated facilities.

**layer** A mechanism for prioritizing the tracks in a movie or the overlapping of sprites. When QuickTime plays a movie, it displays the movie's images according to their layer—images with lower layer numbers are displayed on top; images with higher layer numbers may be obscured by images with lower layer numbers.

**M3U file** An audio metafile that's created using a text editor and saved to a web server. The file directs a user's web browser to an MP3 playlist residing on the same web server and opens the user's MP3 player.

**Mac OS X** The latest version of the Apple operating system. Mac OS X combines the reliability of UNIX with the ease of use of Macintosh.

**Mac OS X Server** An industrial-strength server platform that supports Mac, Windows, UNIX, and Linux clients out of the box and provides a suite of scalable workgroup and network services plus advanced remote management tools.

**Manual Unicast** A method for transmitting a live stream to a single QuickTime Player client or to a computer running QTSS. An SDP file is usually created by the broadcaster application and then must be manually sent to the viewer or streaming server.

**MBONE** Multicast backbone. A virtual network that supports IP multicasting. An MBONE network uses the same physical media as the Internet, but is designed to repackage multicast data packets so they appear to be unicast data packets.

**MIDI** Musical Instrument Digital Interface. A standard format for exchanging music data and performance instructions among computers, synthesizers, and other electronic music devices.

**modifier track** A track in a movie that modifies the data or presentation of other tracks. For example, a “tween” track is a modifier track.

**mount point** In streaming, a string used to identify a live stream, which can be a relayed movie stream, a nonrelayed movie stream, or an MP3 stream. Mount points that describe live movie streams always end with a .sdp extension.

**mov** The Apple QuickTime movie file extension used to name both movie redirect files and actual QuickTime media files.

**movie** A structure of time-based data that's managed by QuickTime. A QuickTime movie may contain sound, video, animation, or a combination of data types. A QuickTime movie contains one or more tracks; each track represents a single data stream in the movie.

**MP3** MPEG layer 3. A popular format for compressing music.

**MPEG-4** An ISO standard based on the QuickTime file format that defines multimedia file and compression formats.

**multicast** In general, the simultaneous transmission of a message to a specific subset of computers on a network. See also **broadcast**, **unicast**. In QuickTime streaming, an efficient, one-to-many form of streaming. Users can join or leave a multicast but cannot otherwise interact with it.

**multihoming** The ability to support multiple network connections. When more than one connection is available, Mac OS X selects the best connection according to the order specified in Network preferences.

**NAT** Network Address Translation. A method of connecting multiple computers to the Internet (or any other IP network) using one IP address. NAT converts the IP addresses you assign to computers on your private, internal network into one legitimate IP address for Internet communications.

**open source** A term for the cooperative development of software by the Internet community. The basic principle is to involve as many people as possible in writing and debugging code by publishing the source code and encouraging the formation of a large community of developers who will submit modifications and enhancements.

**packet** A unit of data information consisting of header, information, error detection, and trailer records. QTSS uses TCP, UDP, and IP packets to communicate with streaming clients.

**pixel** A single dot in a graphic image with a given color and brightness value.

**playlist** A set of media files in the QTSS media folder specified to play one after the other or in random sequence.

**port** A sort of virtual mail slot. A server uses port numbers to determine which application should receive data packets. Firewalls use port numbers to determine whether data packets are allowed to traverse a local network. “Port” usually refers to either a TCP or UDP port.

**privileges** The right to access restricted areas of a system or perform certain tasks (such as management tasks) in the system.

**progressive download** Movie data that’s pushed via HTTP to the client. The movie can be viewed by the user as it is being transferred. This isn’t a form of media streaming.

**protocol** A set of rules that determines how data is sent back and forth between two applications.

**proxy server** A server that sits between a client application, such as a web browser, and a real server. The proxy server intercepts all requests to the real server to see if it can fulfill the requests itself. If not, it forwards the request to the real server.

**QTSS** QuickTime Streaming Server. A technology that lets you deliver media over the Internet in real time.

**QuickTime** A set of Macintosh system extensions or a Windows dynamic-link library that supports the composition and playing of movies.

**QuickTime Player** An application, included with the QuickTime system software, that plays QuickTime movies.

**QuickTime Pro** A version of QuickTime Player with advanced features, primarily the addition of editing capabilities.

**RAID** Redundant Array of Independent (or Inexpensive) Disks. A grouping of multiple physical hard disks into a disk array, which either provides high-speed access to stored data, mirrors the data so that it can be rebuilt in case of disk failure, or both of these features. The RAID array is presented to the storage system as a single logical storage unit. See also **RAID array**, **RAID level**.

**reference movie** A .mov file created using a utility program like MakeRefMovie, available at no cost from Apple for Macintosh and Windows. The file contains the location of a streaming media file and can also contain the locations of multiple streaming files. A reference file linked from a webpage, for example, can direct a client player to the on-demand presentation encoded for its particular connection speed.

**reflected stream** A live broadcast delivered as a unicast stream. Movie and MP4 playlists also generate reflected streams.

**relay** In QuickTime Streaming Server, a relay receives an incoming stream and then forwards that stream to one or more streaming servers. Relays can reduce Internet bandwidth consumption and are useful for broadcasts with numerous viewers in different locations. In Internet mail terms, a relay is a mail SMTP server that sends incoming mail to another SMTP server, but not to its final destination.

**relayed stream** A stream that's passed from one server to one or more other servers. Relays can also be used to generate a multicast stream. QTSS doesn't support relaying of MP3 streams.

**RTP** Real-Time Transport Protocol. An end-to-end network-transport protocol suitable for applications transmitting real-time data (such as audio, video, or simulation data) over multicast or unicast network services.

**RTSP** Real Time Streaming Protocol. An application-level protocol for controlling the delivery of data with real-time properties. RTSP provides an extensible framework to enable controlled, on-demand delivery of real-time data, such as audio and video. Sources of data can include both live data feeds and stored clips.

**sample rate** The number of samples per second used for audio. Higher sample rates yield higher quality audio than lower sample rates.

**SDP** Session Description Protocol. A text file used with QuickTime Streaming Server that provides information about the format, timing, and authorship of a live streaming broadcast and gives the user's computer instructions for tuning in.

**SMTP** Simple Mail Transfer Protocol. A protocol used to send and transfer mail. Its ability to queue incoming messages is limited, so SMTP usually is used only to send mail, and POP or IMAP is used to receive mail.

**sprite** An animated image that's managed by QuickTime. A sprite is defined once and is then animated by commands that change its position or appearance.

**SSL** Secure Sockets Layer. An Internet protocol that allows you to send encrypted, authenticated information across the Internet. More recent versions of SSL are known as TLS (Transport Level Security).

**streaming** Delivery of video or audio data over a network in real time, as a stream of packets instead of a single file download.

**TCP** Transmission Control Protocol. A method used along with the Internet Protocol (IP) to send data in the form of message units between computers over the Internet. IP takes care of handling the actual delivery of the data, and TCP takes care of keeping track of the individual units of data (called packets) into which a message is divided for efficient routing through the Internet.

**temporal compression** Image compression that's performed between frames in a sequence. This compression technique takes advantage of redundancy between adjacent frames in a sequence to reduce the amount of data that's required to accurately represent each frame in the sequence. Sequences that have been temporally compressed typically contain key frames at regular intervals.

**track** A QuickTime data structure that represents a single data stream in a QuickTime movie. A movie may contain one or more tracks. Each track is independent of other tracks in the movie and represents its own data stream.

**TTL** Time-to-live. The specified length of time that DNS information is stored in a cache. When a domain name-IP address pair has been cached longer than the TTL value, the entry is deleted from the name server's cache (but not from the primary DNS server).

**tween track** A track that modifies the display of other tracks.

**UDP** User Datagram Protocol. A communications method that uses the Internet Protocol (IP) to send a data unit (called a datagram) from one computer to another in a network. Network applications that have very small data units to exchange may use UDP rather than TCP.

**unicast** The transmission of data to a single recipient or client. If a movie is unicast to a user using RSTP, the user can move freely from point to point in an on-demand movie.

**URL** Uniform Resource Locator. The address of a computer, file, or resource that can be accessed on a local network or the Internet. The URL is made up of the name of the protocol needed to access the resource, a domain name that identifies a specific computer on the Internet, and a hierarchical description of a file location on the computer.

**VBR** Variable bit rate. A method of compressing data that takes advantage of changes in the media's data rate.

**wav** A Windows format for sound files.

**webcast** A broadcast of live video or audio on the Internet.

**XLR plug** A three-pin audio connector that can be used with three-wire balanced cables, which cause electromagnetic interference to be canceled out.

**XML** An extensible markup language, similar to HTML but more formal and more flexible.

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